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Reviewed for Addressee
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Department of Energy

ROCKY FLATS OFFICE
P.O. BOX 928
GOLDEN, COLORADO 80402-0928

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Mr. Martin Hestmark
U. S. Environmental Protection Agency, Region VIII
ATTN: Rocky Flats Project Manager, 8HWM-FF
999 18th Street, Suite 500
Denver, Colorado 80202-2405

Mr. Gary Baughman
Hazardous Waste Facilities Unit Leader
Colorado Department of Health
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Gentlemen:

Enclosed for your information are two copies of the Draft Final Integrated Field Sampling Plan (FSP) for the Industrial Area Operable Units (OUs), OUs 8, 9, 10,12, 13, and 14, Phase 1 RFI/RI Non-Intrusive Investigations. This document integrates non-intrusive sampling activities such as visual inspections, surface radiological surveys, surface water and sediment sampling, concrete and asphalt sampling, tank and pipeline inspections, surface soil sampling, vertical soil profile sampling, surface geophysical surveys, and radiological air monitoring. The FSP portions of the approved work plans have been integrated to: 1) facilitate consistency and quality of data collection, 2) identify areas of overlap, 3) reduce redundancy in the investigations of the sites, and 4) ensure more efficient use of resources for field sampling. Implementation of the work proposed in this document will not in any way change the intent of the approved work plans or result in a reduction of the scope of work.

The Department of Energy has reviewed the draft version of this document. Our comments have been addressed. However, we are still evaluating refinements to some of the procedures outlined in this document. Possible modifications will be made that will limit the proposed additional sampling in adjacent Individual Hazardous Substance Sites (IHSSs). Procedures for additional sampling may be modified to only occur in adjacent IHSSs if the adjacent IHSS is likely to be in the migration pathway of another IHSS that is less than 100 feet away. Those refinements will not substantially change the approach or procedures described in this document. Therefore, we are submitting the document in the present form to you for your information.

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If you have any questions, please feel free to contact Regina Sarter of my staff at 966-7252.

Sincerely,

Steve Slaten

Steve Slaten
IAG Project Coordinator
Environmental Restoration

Enclosure

cc/w Enclosure:
P. Rogers, CGS
S. Arnold, CDH
J. Love, CDH
L. Carlson, FWS

cc w/o Enclosure:
F. Lockhart, ER, RFFO
R. Sarter, ER, RFFO
J. Burd, ER, RFFO
B. Peterman, EG&G
D. Norbury, CDH
H. Ainscough, CDH
W. Fraser, EPA

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EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC.
ROCKY FLATS PLANT, P.O. BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

May 2, 1994 94-RF-05045

Frazer R. Lockhart
Acting Director
Environmental Restoration Division
DOE/RFFO

SUBMITTAL OF THE DRAFT FINAL INTEGRATED FIELD SAMPLING PLAN FOR THE INDUSTRIAL AREA OPERABLE UNITS (IA OUs) – WSB-050-94

EG&G Rocky Flats, Inc. Remediation Project Management (RPM) is submitting the enclosed Draft Final Integrated Field Sampling Plan (FSP) for the IA OUs 8, 9, 10, 12, 13, and 14 dated April 1994. This Integrated FSP is submitted to document overlap of Individual Hazardous Substance Sites (IHSSs) for the IA OUs based on work outlined in the present versions of the Phase I RCRA [Resource Conservation & Recovery Act] facility investigation/remedial investigation Work Plans for the IA OUs. Future field work efforts that are affected by IHSSs overlap for the IA OUs depend on receiving approval of the Integrated FSP from the Department of Energy/Rocky Flats Field Office (DOE/RFFO) and the regulatory agencies. The Integrated FSP was developed only to present IHSSs overlap and to modify sample analyte lists so that sampling between IHSSs of different OUs can be comparable.

EG&G Rocky Flats has established a review period of five weeks from this transmittal date. Written comments are due to RPM by June 3, 1994. Comments received after June 3, 1994 will not be considered unless prior arrangements have been made with RPM. This version of the Integrated FSP is intended to be distributed to the regulatory agencies. One complete copy of this Integrated FSP is enclosed with this transmittal. Another six copies were hand delivered to S. Slaten of DOE/RFFO on April 28, 1994. EG&G Rocky Flats can provide additional copies as requested.

If you have any questions or require additional information regarding this matter, please contact B. D. Peterman, of my staff, at extension 8659.

For
W. S. Busby
Director
ERM/Remediation Project Management

BDP:alk

Orig. and 1 cc - F. R. Lockhart

Enclosure:
As Stated

cc:
S. Slaten - DOE/RFFO

JUN 1994
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DRAFT FINAL

INTEGRATED FIELD SAMPLING PLAN
Industrial Area Operable Units

ROCKY FLATS PLANT
Operable Units
8, 9, 10, 12, 13, & 14
Phase I RFI/RI
(Non-Intrusive Investigations)

U. S. Department of Energy
Rocky Flats Plant
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

April 1994

Approved By:

_____ / /
Director (Date)

_____ / /
Project Manager (Date)

Integrated Field Sampling Plan,
Industrial Area Operable Units

_____ / /
Quality Assurance Program Manager Date)

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ACRONYMS

ASTM	American Society for Testing Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EG&G	EG&G Rocky Flats, Inc.
FSP	Field Sampling Plan
GPR	Ground Penetrating Radar
HPGe	High Purity Germanium
HRR	Historical Release Report
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
NaI	Sodium Iodide
OPWL	Original Process Waste Line
OU	Operable Unit
PCB	polychlorinated biphenyls
QAPjP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RFEDS	Rocky Flats Environmental Data System
RFI/RI	RCRA Facilities Investigation/CERCLA Remedial Investigation
RFP	Rocky Flats Plant
SOP	Standard Operating Procedure
SOW	Statement of Work

TAL	target analyte list
TPH	total petroleum hydrocarbons
VI/SW	Visual Inspection Site Walk
VOA	volatile organic analysis
VOC	Volatile Organic Compound
VSP	Vertical Soil Profile

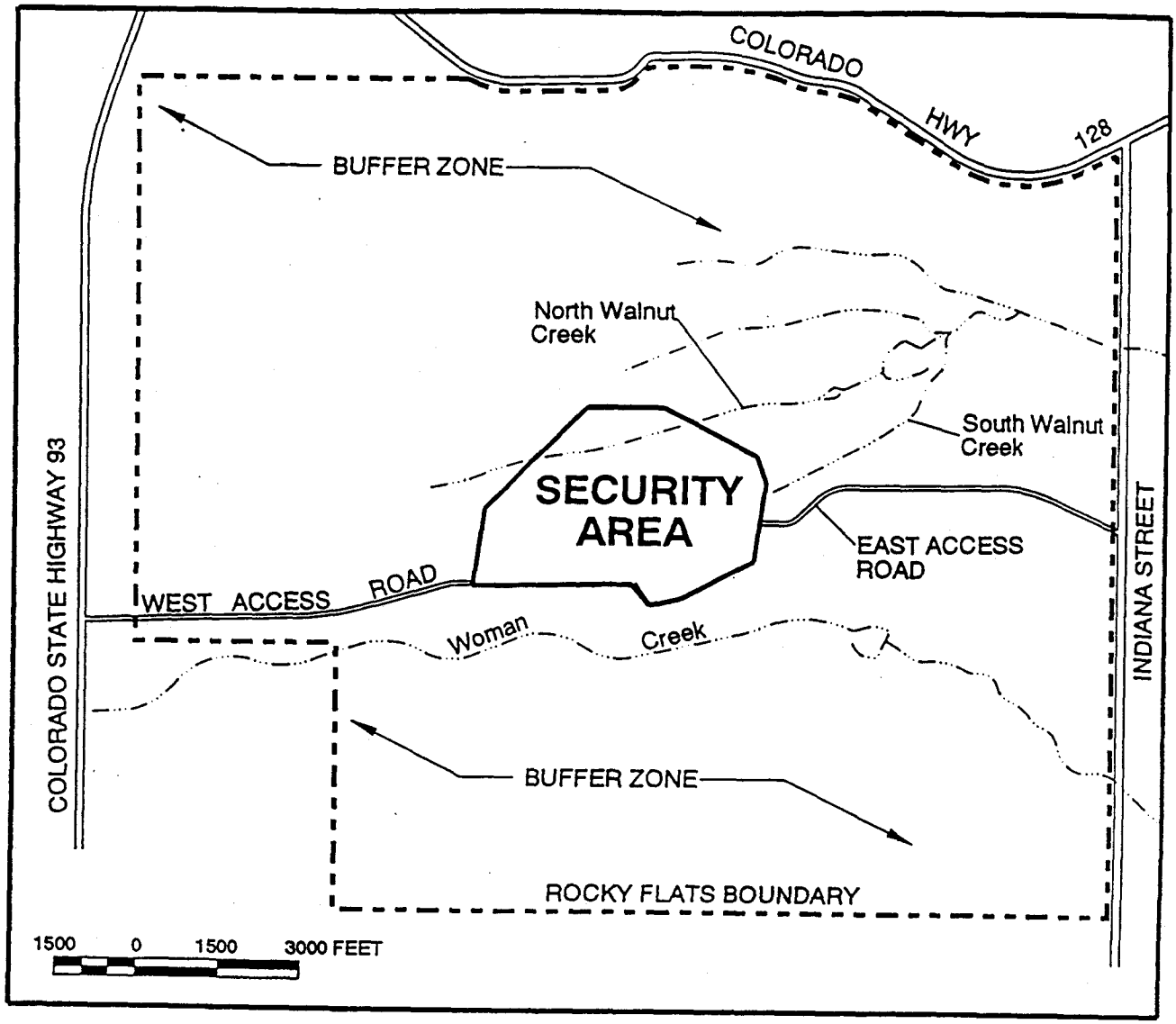
Approved By:

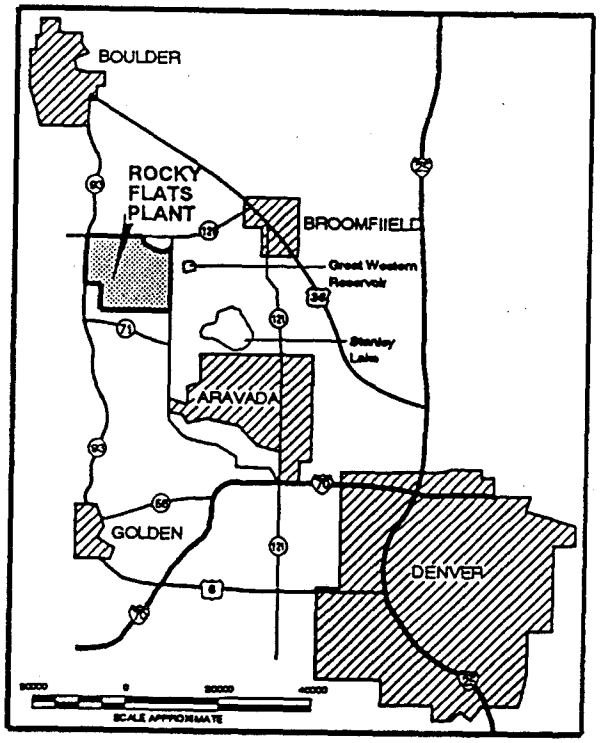
Director	/ / (Date)
Project Manager	/ / (Date)
Quality Assurance Program Manager	/ / (Date)

1.0 INTRODUCTION

The purpose of this document is to provide an Integrated Field Sampling Plan (FSP) for the coordination of field sampling efforts within Operable Units (OUs) 8, 9, 10, 12, 13, and 14 at the EG&G Rocky Flats Plant (RFP) located in Golden, Colorado (Figure 1-1). These sampling efforts are performed in support of the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation (RFI/RI) activities for the industrial area OUs at RFP. The goal of the nonintrusive field investigations of the RFI/RI is to collect the data necessary to evaluate and develop subsequent field investigations, including more intrusive tasks such as drilling boreholes and installing monitoring wells for each Individual Hazardous Substance Site (IHSS).

The general objectives of this FSP are to summarize the individual field sampling plans contained in the approved OU Work Plans and to develop an integrated field data collection approach for all six OUs identified above. Collectively, these six OUs will be referred to as the Integrated OUs. For purposes of this report, the integration effort will focus on nonintrusive sampling activities. During implementation of nonintrusive field activities, this FSP will be used in conjunction with the approved OU Work Plans for the six OUs listed above. The FSP portion





MODIFIED FROM: PHASE ONE RFI/RI WORK PLAN, OU9, EG&G, 1992

PREPARED FOR
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 1-1

ROCKY FLATS LOCATION MAP 12/1/90

of the approved OU Work Plans have been integrated to (1) facilitate consistency and quality of data collection, (2) identify areas of overlap, (3) reduce redundancy in the investigations of the sites, and (4) ensure more efficient use of resources for field sampling at RFP.

This FSP presents the procedures or references for the procedures for performing all nonintrusive tasks described in EG&G Rocky Flats, Inc.'s (EG&G's) Statement of Work (SOW) (EG&G 1993). These nonintrusive tasks include visual inspections, surface radiological surveys, surface water and sediment sampling, concrete and asphalt sampling, tank and pipeline inspections, surface soil sampling, vertical soil profile sampling, surface geophysical surveys, and radiological air monitoring at the Integrated OU sites. A schedule showing EG&G and U.S. Department of Energy (DOE) milestones will also be included in this FSP.

The specific objectives of this Integrated FSP are as follows:

- Summarize existing FSPs contained in the respective Work Plans for OUs 8, 9, 10, 12, 13, and 14 for nonintrusive activities.

- Compare sampling protocols and data quality objectives (DQOs) among the six Work Plans to identify areas of inconsistencies (if any).

- Identify nonintrusive activities among overlapping and/or adjacent IHSSs that can be combined to minimize redundancy.

- Define the number of samples to be collected, based on the comparison of the FSPs.

- Describe or reference the procedures to be used for sample collection, preservation, packaging, and transport.

- Identify the constituents to be analyzed.

- Define the necessary documentation for sample custody and record keeping.

These objectives are designed to accrue adequate and defensible data to support the planning of future intrusive data collection activities that are required for the ultimate development and evaluation of remedial alternatives for the sites. Specific goals for the nonintrusive data collection activities at each OU are as follows:

- Confirm or refute historical information and accurately locate and describe the contaminants, release mechanisms, and potential transport mechanisms for each IHSS.

- Identify potential discrepancies (contaminants or locations) for individual IHSSs.

- Supplement the existing conceptual site models.

- Determine the type, location, and nature of future intrusive data collection activities necessary to meet the overall objectives of the RFI/RI for each IHSS.

The nonintrusive activities proposed to achieve these goals and the tasks specified within EG&G's SOW and the RFP Interagency Agreement (IAG) (Environmental Protection Agency [EPA] et al. 1991) have been summarized in this FSP. It should be noted, however, that specific nonintrusive sampling activities for all of the IHSSs of OU9 have not been identified.

The OU9 Work Plan called for data compilation, site visits, and RFP personnel interviews to be conducted before proposing nonintrusive sampling activities at specific IHSSs. To date, these activities have been completed for OU9 storage tanks located outside the industrial area buildings located at RFP. A summary of the proposed nonintrusive sampling activities for these tanks has been prepared in the OU9 Technical Memorandum No. 1, Volume I (Jacobs 1994a). Activities referenced in this technical memorandum was incorporated into the overlapping/adjacent evaluation discussed in this FSP. Similarly, the OU13 Draft Technical Memorandum No. 1 (Jacobs 1994b) was used during this evaluation.

2.0 INTEGRATED OU FIELD SAMPLING PLAN COMPARISONS

This section of the FSP summarizes information regarding OU background, sampling rationale, and approach and compares analytical rationale, data quality objectives (DQOs), and quality assurance/quality control (QA/QC) requirements among the respective OUs. In addition, overlapping and adjacent IHSS sampling areas are identified and recommendations provided to consolidate the field sampling efforts for each OU. This document will not discuss in detail the history and specific field sampling activities proposed for each IHSS but will provide a more generalized summary for each OU as taken from the respective Work Plans. The reader is directed to the individual OU RFI/RI Work Plans (EG&G 1992a,b,c,d,e,f) and the Historical Release Report [HRR] DOE 1992a) for the detailed information.

2.1 BACKGROUND

As indicated in EG&G's Fiscal Year 1993 Site Specific Plan (DOE 1993) and the IAG, IHSSs have been grouped into separate OUs. An IHSS is defined as a location associated with the threat or actual release of hazardous substances which may cause harm to human health and the environment. Table 2-1 provides a summary of the site description and location per IHSS for

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
8	118.1	West of Building 730	A 20- by 40-foot area near a former UST containing carbon tetrachloride or trichloroethene west of building 730.
8	118.2	South End of Building 77	A 20-by 30-ft area between Buildings 707 and 778, a carbon tetrachloride spill.
8	123.1	Valve Vault 7 Southwest of Building 707	A 40-by 40-ft area south of Sage Avenue and west of North Street. A process wastewater spill, containing uranium solvents, oils, beryllium, nitric acid, hydrochloric acid and fluoride.
8	135	Cooling Tower Blowdown Northeast of Building 374	A 115-by 40-by 50-ft area northeast of Building 374. Possible tritium contamination from cooling tower blowdown water.
8	137	Cooling Tower Blowdown Buildings 712 and 713	A 10-foot wide zone beyond the foundations of 712 and 713 possible contamination from cooling tower blowdown water contaminated with chromates.
8	138	Cooling Tower Blowdown Near Building 779	A 50-by 50-ft area north of Building 727. A pipe leak and effluent spill toward trench 6, possible chromium and radiation activity.
8	139.1 (North & South)	Hydroxide Tank Area Buildings 771 and 774	NaOH steam condensate tanks and KOH tank, possible chromium and 3,000 disintegrations per minute per liter alpha activity.
8	139.2	Hydrofluoric Acid Tank Area - Building 174	Possible spill from horizontal 1300 pound hydrofluoric acid cylinders.
8	144	Sewer Line Breaks Near Building 730, Tanks 776 A-D	Four underground waste-holding tanks north of Building 776 and east of Building 70/A. Possible elevated radioactivity.
8	150.1	Radioactive Site North of Building 771	Radioactive waste leaks north of Building 771 and 776.
8	150.2	Radioactive Site West of Buildings 771 and 776	From the 1957 fire in Building 771. Water from the fire fighting contaminated soil west of Buildings 771 (plutonium).
8	150.3	Radioactive Site West of Buildings 771 and 774	Radioactive leak from process waste lines into a tunnel which connects Buildings 771 and 774, could have also contained nitrates, and other chemical contaminants.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
8	150.4	Radioactive Site East of Building 750	Leaking process waste line near a sump located outside of Door 3 south of building 778. There is a possibility that decontamination of equipment occurred in the area after 1969 fire, probably contaminated with plutonium.
8	150.5	Radioactive Site West of Building 707	IHSS 150.5 is the same as IHSS 123.2. IHSS 123.2 has been transferred by the leading agencies into OU9.
8	150.6	Radioactive Site South of Building 779	Contaminated oil from a cut-apart drum was tracked by pedestrians to the first floor dock and surrounding outdoor areas south and east of Building 779.
8	150.7	Radioactive Site South of Building 776	From 1969 fire, plutonium tracked outside of Building 776 by fire fighting.
8	150.8	Radioactive Site South of Building 779	An improperly opened, radioactively contaminated waste drum was spread by pedestrian tracking.
8	151	Fuel Oil Leak - Tank 262 North of Building 374	UST No. 2 diesel fuel oil a 45-by 60-ft area centered over tank.
8	163.1	Radioactive Site North of Building 774	A 50-by 125-ft area northwest of Building 774. Reportedly, area used to wash radioactive-contaminated vehicles.
8	163.2	Radioactive Site North of Buildings 771 and 774	An 8-by 8-ft slab buried near Building 771A. Slab used as a foundation for a 5,000-gallon stainless steel tank used in the filtrate recovery ion exchange system.
8	172	Central Avenue Waste Spill	Approximately 1 mile of Central Avenue from 903 Pad to Building 771. A drum of contaminated lathe coolant leaked during its transport to the waste treatment facility. Possibly carbon tetrachloride and machine cutting oil, percholoroethylene, uranium, and plutonium.
8	173	Radioactive Site 900 Area, Dock Area, Building 991	Activities at the dock included cleaning of depleted uranium parts with acetone, perchloroethene, and trichloroethane.
8	184	Radioactive Site Building 991 Steam Cleaning Area (Near Building 992)	A 55-by 75-ft area located south of Building 991 used to steam clean radioactively contaminated equipment and drums.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
8	188	Acid Leak, Southeast Corner of Building 374	A 55-gallon drum containing nitric and hydrochloric acid leaked. The mixture was suspected to be a waste leaching solution originating from the 400 Area which may have contained trace heavy metals.
9	121	Original Process Waste Line (OPWL). A network of pipelines and tanks which extends throughout much of the RFP main production complex. It is 35,000 feet of underground pipelines and 39 tank locations with a total of 65 tanks.	Used to transport and temporarily store process wastes to on site treatment and discharge points. Potential contaminants include uranium 238 and 235; plutonium, nitrate, acids, bases, hexavalent chromium, beryllium, iron, iodine, phosphate, tritium.
9	122	Underground Storage Tanks South of Building 441	Tanks stored process waste from Buildings 441 and 123. Nitrates and radionuclides would be present.
9	123.2	Valve Vault West of Building 707	A liquid release containing uranium, solvents, oil beryllium, nitric and hydrochloric acids, and fluoride.
9	124.1	One Tank East of Building 774	A release of process wastewater, high in nitrate and contaminated with plutonium and uranium.
9	124.2	One Tank East of Building 774	A release of process wastewater, high in nitrate and contaminated with plutonium and uranium.
9	124.3	One Tank East of Building 774	A release of process wastewater, high in nitrate and contaminated with plutonium and uranium.
9	125	Holding Tank East of Building 774	A release of process wastewater, high in nitrate and contaminated with plutonium and possibly uranium.
9	126.1	Out-of-service Process Waste Tanks in Building 728	A release of liquid process wastes contaminated with nitrate, plutonium, uranium, and various other organic and inorganic constituents.
9	126.2	Out-of-service Process Waste Tanks in Building 728	A release of liquid process wastes contaminated with nitrate, plutonium, uranium, and various other organic and inorganic constituents.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
9	127	Process Waste Line Between Building 774 and the Sanitary Wastewater Treatment Plant	Numerous line breaks. The waste is characterized by high nitrate levels with plutonium contamination.
9	132	Underground Storage Tanks Under Building 730	Leaking underground storage tanks, containing mostly water with small amounts of detergent and radionuclides.
9	146.1	One Underground Concrete Process Waste-Holding Tank South of the Original Building 774	The process waste stored in the tank was an aqueous solution with plutonium, uranium, acids, and caustics.
9	146.2	One Underground Concrete Process Waste-Holding Tank South of the Original Building 774	The process waste stored in the tank was an aqueous solution with plutonium, uranium, acids, and caustics.
9	146.3	One Underground Concrete Process Waste-Holding Tank South of the Original Building 774	The process waste stored in the tank was an aqueous solution with plutonium, uranium, acids, and caustics.
9	146.4	One Underground Concrete Process Waste-Holding Tank South of the Original Building 774	The process waste stored in the tank was an aqueous solution with plutonium, uranium, acids, and caustics.
9	146.5	One Underground Concrete Process Waste-Holding Tank South of the Original Building 774	The process waste stored in the tank was an aqueous solution with plutonium, uranium, acids, and caustics.
9	146.6	One Underground Concrete Process Waste-Holding Tank South of the Original Building 774	The process waste stored in the tank was an aqueous solution with plutonium, uranium, acids, and caustics.
9	147.1	Process Waste Line North of Building 881	High nitrate levels, uranium, plutonium, beryllium, acids, and solvents.
9	149.1	Two pvc Pipes Between Building 774 and the 207 Solar Evaporation Ponds	Low-level radioactive wastes containing caustics and acids.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
9	149.2	Two pvc Pipes Between Building 774 and the 207 Solar Evaporation Ponds	Low-level radioactive wastes containing caustics and acids.
9	159	Radioactive Site Building 559	Process waste consisting of and aqueous solution with radioactive constituents.
9	215	A Concrete Mixed Waste Storage Tank Near Building 771	The tank held sludge from second stage precipitation of liquid process waste from Building 771, and silver effluent from Building 774.
10	129	Approximately 25 Feet East of Building 443	Underground fuel oil tank and ancillary piping. Also stored #2 diesel, waste water and compressor oil, solvents, and trace amounts of 1,1,1-Trichloroethane.
10	170	Property Utilization and Disposal Storage Yard. Approx. 260- by 1,000-Foot Area, Southeast of the Present Landfill	Area used to store various containers of waste oils and spent solvents.
10	174	A 60- by 60-Foot Area Near the Northeast Corner, and a 20- by 40-Foot Area Along the Northern Fenceline, of the Property Utilization and Disposal Storage Yard	Area used to store drums of maintenance and fabrication shops waste liquids, waste paints, waste paint thinner, stainless steel chips coated with freonbased or oil based lathe coolant.
10	175	A 25- by 25-Foot Area in the Eastern Third of a Storage Yard South of Building 980	Area used to store drums of maintenance and fabrication shops waste liquids. Generally, drums contained waste oils and thinners.
10	176	Swiggerton & Walberg Contractor Storage Yard. A 290- by 390-Foot Area, Approximately 50 Feet East of Solar Evaporation Ponds, in Vicinity of Building 964	Containers stored intermittently throughout area, including mineral spirits, waste oil, volatile organic compounds and metals. Low level radioactivity has also been detected.
10	177	Two 10- by 20-Foot Areas in the Eastern and Western Sections Respectively, of Building 885	Drum storage areas. Western area stored unused and waste oils. Eastern area stored unused and waste paint and paint solvents. Waste materials also contained low level radioactive wastes.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
10	181	Small Portion of Parking Lot North of Building 334	Former location of 8-by 20-ft cargo container used to store drums of machine oils, solvents, coolants and possibly low-level radioactive wastes.
10	182	An Approx. 1,700 Square Foot Area Between Buildings 444 and 453	A drum storage area. Drums contained waste hydraulic oils and chlorinated solvents. Beryllium and low-level depleted uranium oxide waste contamination present in some of the waste.
10	205	Outside of Building 460, Along Southeast Corner of the Building	Portable cylindrical vessels used to collect waste nitric acid hydrofluoric acid and ammonium salts.
10	206	East Side of Building 374	Area where an 8-ft diameter by 49.5-ft long steel storage tank was located. Tank stored off-specification Building 374 product water. Water contained low concentrations of tritium.
10	207	A 9.5- by 9-Foot Area at the East Side of Building 444	Bermed area which contained acid waste dumpsters. Acids were a mixture of phosphoric acid, sulfuric acid and chromium trioxide. Waste acid contained cyanide, cadmium chromium, lead, silver, arsenic, uranium, americium, and tritium contamination. Dumpsters have been removed.
10	208	Approximately 30 Feet West of Building 453	An 8-by 20-ft. cargo container. Wastes stored were a composite of nitric acid with silver, sodium fluoride, sodium fluoride solution, plating acids (hydrochloric, nitric, hydrofluoric) with chromium plating solution, cadmium cyanide solution, nickel sulfate, developer, and fixer.
10	210	South of Spruce Avenue and East of 10th Street, Approx. 40 Feet South of Building 980	An 8-by 20-ft cargo container and adjacent 20-by 20-ft area used to store drums of waste auto oil, solvents, paints, thinner, grease, gasoline, diesel fuel, and fiberglass resins and catalysts.
10	213	Southeastern Portion of the Production Area	A 439-by 295-ft area covered with asphalt. Used to store pondcrete; a mixture of Solar Evaporation Pond sludge and sediment with portland cement. Potential contamination by nitrate, low level radiation, and volatile organic compounds.
10	214	Approx. 90 Feet East of Building 750	A 142,000-square ft area covered with asphalt. Used to store pondcrete; a mixture of Solar Evaporation Pond sludge and sediment with portland cement. Solidified low level radioactive and hazardous wastes.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
12	116.1	West Loading Dock Building 447	Spills and leaks from oil stored in drums. Suspected solvents and hydrocarbons, may also be low level radioactive materials.
12	116.2	South Loading Dock Building 444	Many incidents of drum leakage and spills. Contaminants include uranium, uranium oxide, tetrachloride, nitric acid, chlorinated hydrocarbon solvents, and beryllium. Beryllium soil concentrations range from 350 to 1000 micrograms per gram. Direct uranium activity readings were recorded as high as 7,500 disintegrations per minute. Direct uranium air counts have been recorded as high as 1,372 disintegrations per minute.
12	120.1	Fiberglassing Areas North of Building 664	Spills of polyester resin peroxide catalyst materials and unspecified cleaning solvents. Higher than background levels of gamma radiation from plutonium, uranium, and americium have been detected.
12	120.2	Fiberglassing Area West of Building 664	Potential residue from spills of polyester resin peroxide catalyst and unspecified cleaning solvents. Higher than background levels of radiation from plutonium and uranium.
12	136.1	Cooling Tower Pond East of Building 444	Used to collect solutions used to clean the cooling towers, reportedly acidic or lithium dichromate, lithium chromate and hexavalent chromium. Small amounts of depleted uranium may have been buried here as well.
12	136.2	Cooling Tower Pond East of Building 444	Used to collect solutions used to clean the cooling towers, reportedly acidic or lithium dichromate, lithium chromate and hexavalent chromium. Small amounts of depleted uranium may have been buried here as well.
12	136.3	Cooling Tower Pond West of Building 444	IHSS 136.3 has been determined to be the same as IHSS 136.1. This information is presented in the approved OU12 work plan.
12	147.2	Building 881 Conversion Activity, 150 Feet South of Building 865, 250 Feet East of Building 883 and 450 Feet South of Central Avenue	Storage of equipment during conversion process. Beryllium and enriched or depleted uranium.
12	157.2	Radioactive Site South Area Building 444, 447, 440 and 439	Several incidents of spills and fires, contaminated soils around these buildings, including depleted and enriched uranium, beryllium, chlorinated hydrocarbon solvents, including carbon tetrachloride, hydraulic oil, lithium, and chromium.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
12	187	Sulfuric Acid Spill East of Building 4433	1,500-gallons of 94 percent sulfuric acid spilled from an aboveground storage tank. 32,000 pounds of lime were added to neutralize the acid. In addition, 200 additional gallons went to the sewer system.
12	120.1	Fiberglassing Areas North of Building 664	Spills of polyester resin peroxide catalyst materials and unspecified cleaning solvents. Higher than background levels of gamma radiation from plutonium, uranium, and americium have been detected.
12	120.2	Fiberglassing Area West of Building 664	Potential residue from spills of polyester resin peroxide catalyst and unspecified cleaning solvents. Higher than background levels of radiation from plutonium and uranium.
12	189	Nitric Acid Tanks North and West of Building 881	Three nitric acid spills. Two of the spills were neutralized with sodium bicarbonate.
12	147.2	Building 881 Conversion Activity, 150 Feet South of Building 865, 250 Feet East of Building 883 and 450 Feet South of Central Avenue	Storage of equipment during conversion process. Beryllium and enriched or depleted uranium.
13	117.1	North Chemical Storage Site, Northeast of Building 552, West of Building 559	Buried nonradioactive material including aluminum machine turnings, rings, shapes, overlays and other metal parts, contaminated with uranium chips.
13	117.2	Middle Chemical Storage Site, East of Building 551	Multipurpose storage, including acids, soaps, solvents, beryllium chips and turnings, drums of aluminum scraps and drums of aluminum nitrate. Monitoring indicated occasional buildup of radioactivity.
13	117.3	South Chemical Storage Site, Southwest Corner of Central Avenue and Seventh Street	A wooden waste box containing a glovebox leaked which contaminated oil. Probably plutonium contaminated.
13	128	Oil Burn Pit No. 1 Waste Leak, North of Building 335	Experimental oil burning in a pit now buried. Reportedly 200-gallons of what is suspected to have been perchloroethene containing depleted uranium.
13	134	Lithium Metal Destruction Site, Beneath an Eastern Addition of Building 331 and Sage Avenue	Waste lithium mixed with machinery oils was burned in 55-gallon drums for the fire department training. Sodium, calcium, solvent-type chemical compounds; graphite; and magnesium may also have been present.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
13	148	Waste Spills Outside of Building 123	Small spills of nitrate-bearing wastes. Leaks from process waste lines. Possible low level radioactive wastes, with nitrates.
13	152	Fuel Oil Tank East of Building 452	No. 6 fuel oil spills and leaks.
13	157.1	North Area Radioactive Site, Building 444	Leak of spills from laundry operations, levels of radioactivity in soils range from 1.8×10^4 to 5.2×10^5 disintegrations per minute per kilogram. Contaminants include depleted uranium, enriched uranium, beryllium, and solvents.
13	158	Building 551 Radioactive Site	Laundry dock, storage area for off site shipment by train. Low level radioactive contamination from uranium.
13	169	Waste Peroxide Drum Burial, Chemical Storage Area East of Building 551	Spill of 35 percent hydrogen peroxide.
13	171	Solvent Burning Ground East of Building 335	Diesel fuel and gasoline burned and extinguished for training purposes, magnesium may also be present. Waste solvents may also have been present.
13	186	Valve Vault West of Building 552	Pipe leak - uranium nitrate, plutonium, americium, chloride and sulfate, and oakite.
13	190	Caustic Leak Southeast Corner of Building 443	A 1,500-gallon sodium hydroxide spill.
13	191	Hydrogen Peroxide Spill Near the Intersection of Fifth Street and Central Avenue.	Two 55-gallon drums of 35 percent hydrogen peroxide fell from a pallet.
13	197	Scrap Metal Site Located West of Building 559	Originally a low priority site classified under OU16. Scrap metal was reportedly buried in this area in the last 1950s and early 1960s.
14	131	Radioactive Site 700 Area Site No. 1, Building 776 Gas Bottle Dock	Explosion which released plutonium.
14	156.1	Radioactive Site Building 334 Parking Lot	Contaminated soil pile - subsequently removed. Prior to removal soil samples were 3 to 704 disintegrations per minute per gram.

TABLE 2-1
INTEGRATED OPERABLE UNIT
LOCATION AND HAZARD SUMMARY BY IHSS
ROCKY FLATS PLANT

OU	IHSS	LOCATION	DESCRIPTION
14	160	Radioactive Site Building 444 Parking Lot	Storage area for punctured or leaking waste drums and boxes. Uranium, plutonium, PCBs, tetrachloroethylene, carbon disulfide, and 1,1,1-trichloroethene.
14	161	Radioactive Site Area West of Building 664	Punctured or leaking drums and boxes. Americium-241, plutonium, uranium, hydraulic oil, tetrachloroethylene, and other volatile organics.
14	162	Radioactive Site 700 Area Site No. 2 South of Building 771	Unknown source - volatile organics, radionuclides, beryllium, iron, chromium, hexavalent chromium, nitric acid, hydrochloric acid, and fluoride.
14	164.1	Radioactive Site 800 Area, No. 2. Concrete Slab, Northwest Building 881	Storage of a plutonium-contaminated slab.
14	164.2	Radioactive Site 800 Area, Site No. 2 Building 886 Spills	Spills as a result of movement of contaminated equipment and other activities. Accumulated groundwater in pit is likely uranium-contaminated.
14	164.3	Radioactive Site 800 Area Site No. 2 Buildings 889 Storage	Decontamination facility for uranium contaminated equipment.

all of the Integrated OUs. Plate 1 provides a graphic illustration of the respective IHSSs in each OU in the industrial area of RFP.

The following is a brief description of the individual Integrated OUs.

2.1.1 OU8 - 700 Area

The 700 Area is located in the north-central portion of RFP (Plate 1). It is bounded on the north by the buffer zone, on the east by the Solar Evaporation Ponds, on the southeast by the 900 Area, on the south by the 800 Area, and on the west by the 500 Area. OU8 consists of 24 IHSSs. At most OU8 sites, the nature of the contamination is not specifically known (Table 2-1).

2.1.2 OU9 - Original Process Waste Lines

OU9 is the original process waste line (OPWL), which consists of a network of pipelines and tanks extending throughout much of the RFP complex (Plate 1). The OPWL comprises 35,000 feet of underground pipelines and 39 tank locations, and was used to temporarily store and transport process wastes before onsite treatment and discharge.

2.1.3 OU10 - Other Outside Closures

OU10 consists of 15 IHSSs: four large surface storage areas, four drum storage areas, three former aboveground tank locations, two locations of former cargo containers with drums, one former location of a combined drum surface storage and cargo container area, and one underground storage tank (Table 2-1 and Plate 1).

2.1.4 OU12 - 400/800 Area

OU12 consists of 10 IHSSs that can be categorized by type and size: two are small loading docks, two are backfilled ponds used to impound cooling tower water, two are fiberglass areas, one has a varied history, two are acid spill areas, and the remaining one is a storage yard (Table 2-1 and Plate 1).

2.1.5 OU13 - 100 Area

OU13 consists of 14 IHSSs and is characterized by three chemical storage sites, one oil burn pit, one lithium metal destruction site, waste spills, fuel oil spills and leaks, two radioactive sites, one waste peroxide drum disposal, one solvent burning ground, a valve vault, a caustic leak, and a hydrogen peroxide spill (Table 2-1 and Plate 1).

2.1.6 OU14 - Radioactive Sites.

OU14 consists of eight IHSSs contaminated with the radioactive constituents of uranium or plutonium (Table 2-1 and Plate 1).

2.2 SAMPLING RATIONALE

The site history and available environmental data that was previously collected at each IHSS were used to develop sampling strategies for each site investigation. Limited environmental data have been collected for OUs 10, 13, and 14. No previous data are available for OUs 8, 9, and 12. Historical information presented in the HRR (DOE 1992a) provides general indications concerning the types of chemical or radioactive compounds that may be anticipated at individual

IHSSs. Soil contamination could have resulted from historical spills, releases to the air, storage of material, or ponding of liquids at most of these sites. Asphalt paving, concrete, or soil regrading occurred after many of the reported spills or incidents, removing visible evidence of spills or possible releases.

The RFI/RI Work Plans for each Integrated OU detail the respective IHSSs and the rationale for the proposed environmental media sample collection. Given the variable natures of the OUs and their diverse histories, sampling programs have been designed to be IHSS-specific. The sampling rationale has been developed to allow for a systematic investigation of potentially contaminated media at each IHSS. In general, the following non-intrusive sampling activities will be conducted for the Integrated OUs at some or all of the IHSSs:

- Historical information and previous sampling data will be evaluated for those IHSSs where potential sources of contamination are not known.

- Surface radiation surveys will be performed at specific IHSSs to measure and document the presence and character of surfical radionuclide contamination. The surveys will be performed using high purity germanium (HPGe) and sodium iodide (NaI) detectors.

- Surface water and sediment sampling of the storm and sanitary sewer systems will be performed to provide information for a given IHSS as a potential source of contaminants.

- Concrete and asphalt sampling will be performed at those IHSSs of anomalous radionuclide surface activity identified by the HPGe and NaI probe surveys.

- Soil gas samples will be collected, extracted, and analyzed in the field for suspected volatile organic compound (VOC) contamination in specific IHSSs.

- Tank and pipeline inspections will be conducted for appropriate IHSSs based on the condition of these structures and the presence of residual product or waste materials.

- Surface soil sampling will be collected to determine contaminant variability.

- Vertical soil profile samples will be collected as a component of the HPGe survey. These samples will assist in the determination of the vertical extent of radionuclide contamination.

- Surface geophysical surveys will be conducted to aid in locating underground utilities and structures.

Environmental samples will be collected to achieve the DQOs discussed in Section 2.4. A more detailed description of the activities listed above for each IHSS and their application to the Integrated OUs is provided in Section 3.0.

In the event that the radiation surveys, surfical soil and sediment sampling, and soil-gas results indicate that none of the media sampled are contaminated, then further sampling activities may not be necessary at these locations. Conversely, if contaminated media are detected during the performance of any of the nonintrusive investigations, additional intrusive investigative activities will be conducted for each IHSS during the next stage of investigations as proposed in the respective RFI/RI Work Plans. The objectives of the intrusive activities include further characterizing the contaminated material and defining the extent of contamination detected during

the nonintrusive sampling activities. If required, a separate Integrated FSP may be prepared to address the coordination of intrusive sampling activities for the Integrated OUs.

The results of the nonintrusive activities will be summarized in a technical memorandum for each OU and submitted to EG&G, DOE, and the appropriate regulatory agencies for review. The memorandum will summarize both background and collected data used to determine the extent to which the RFI/RI objectives have been fulfilled. The memorandum will also present the quantities and concentrations of specific constituents at each IHSS, the potential transport mechanism, and the expected fate of each contaminant in the environment. The technical memorandum will also propose the anticipated intrusive data collection activities necessary to support the risk assessment and feasibility studies. Where appropriate, recommendations for changes in the work plan-specific investigations will be proposed in the technical memorandum.

2.3 COMPARISON OF OPERABLE UNIT ANALYTICAL RATIONALE

To fulfill the objectives of this report, the references and databases used to select the analytical suite proposed for each IHSS (by OU) were reviewed to determine whether the rationale used to select the respective analytes were consistent for each OU. After completion of this study, it was determined that the rationale used to select the analytes of concern specified in the Integrated OU Work Plans was consistent. The IHSS-specific analyte selection proposed in the respective work plans took into account the following considerations:

- The operating history of the IHSS suggests a strong probability that contaminants were released into the environment.

- The physical and chemical properties of the contaminant suggest that the contaminant is persistent once it has been released into the environment.

- The principal contaminants of concern used to select the analytical suite were taken from Attachment 2, Table 5, and Attachment 4 of the IAG and are discussed in the HRR.

- Rocky Flats Environmental Data System (RFEDS) analytical data monitoring surface water, soil, groundwater, and air data that are applicable to the Integrated OUs indicate the presence of contaminants in quantities above the maximum background concentrations for RFP.

2.4 COMPARISON OF DATA QUALITY OBJECTIVES

The primary objective of the RFI/RI is to collect sufficient data specific to each IHSS so that the degree of the potential risks to human health and the environment can be evaluated. Once the potential risks have been identified as warranting remedial action, the data collected during this effort will be used to develop and screen the appropriate remedial measures to mitigate the risks to acceptable levels. DQOs are established to define the required data to make these decisions and to ensure that the data are of sufficient quantity and quality.

DQOs have been developed for each Integrated OU and are detailed in the respective RFI/RI Work Plans for the Integrated OUs. A copy of the DQO tables from each OU Work Plan is included in Appendix A. Although each work plan contains the basic requirements for DQOs, they are not presented in a consistent format. In an effort to integrate DQOs for the Integrated OUs, DQOs have been summarized in one format using six categories (1) Establish the Presence or Absence of Contamination, (2) Characterize the Environmental Setting, (3) Characterize the Nature and Extent of Contamination, (4) Assess Fate and Transport, (5) Assess Risk to Human Health and Environment, and (6) Identify Remedial Measures. A seventh category, Characterization of Hazard, was added for OU 9 because of the preliminary nature of the

investigation at this OU. Data requirements for the other categories will be identified for OU 9 as the investigation progresses.

Table 2-2 presents the comprehensive DQO requirements. As work proceeds and new data are generated, DQOs for all of the Integrated OUs will be evaluated for consistency and overlap to ensure that a comprehensive, integrated approach is followed for subsequent stages of the RI/RFI. For instance, under the category Assess Fate and Transport of Contaminants, soil physical parameters such as grain size, total organic carbon, etc. are listed as DQOs at OUs 8 and 10. These data may also, at a later date, be identified as a requirement for other OUs.

2.5 COMPARISON OF QUALITY ASSURANCE/QUALITY CONTROL CONSISTENCY

When comparing the QA/QC requirements among the RFI/RI Work Plans for the Integrated OUs, only one conflict was identified. The field duplicate samples for OU 10 were identified as one in 10; however, the other work plans and the site-wide Quality Assurance Project Plan (QAPjP) (EG&G 1991) identify the requirement as one in 20. For this document, the site-wide QAPjP was considered the overriding document. Therefore, all field duplicates will be collected at a minimum of one in 20.

2.6 IDENTIFICATION OF SAMPLE AREA OVERLAP AND RECOMMENDATIONS

In an effort to minimize redundancy among the field sampling efforts conducted during the nonintrusive sampling activities, the FSP portions of the Integrated OU Work Plans were reviewed and compared to identify any overlapping sample areas. The sample activity and locations of the nonintrusive sampling activities proposed within areas of geographically overlapping OUs (Plate 1) were reviewed and redundant sampling locations identified. Tables 2-3 through 2-7 contain a summary of this analysis by OU with associated recommendations regarding these overlapping sample areas.

TABLE 2-2
INTEGRATED OPERABLE UNITS
SUMMARY OF DQOs FOR OUs 8, 9, 10, 12, 13, and 14
ROCKY FLATS PLANT

SPECIFIC OBJECTIVE (DATA NEED)	OPERABLE UNIT(S)	DATA TYPE	SAMPLING AND ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
Characterization of hazard	8,9	Data compilation	Compile and review documents.	NA	Focus field investigation activities.
	9	Conduct interviews	Interview RFP personnel.	NA	Focus field investigation activities.
Establish the presence or absence of contaminants	8, 10, 12, 13, 14	Soil gas	For specified IHSSs, conduct HPGe/NaI surveys and soil-gas survey, collect surface soil samples, subsurface soil samples, groundwater samples, surface water and sediment, and asphalt samples, as necessary.	I for NaI, II for HPGe radiation survey IV for nonradiation, V for radiation	Contaminant source and multimedia characterization
	8, 10, 12, 13, 14	HPGe, NaI surveys			
	8, 10, 12, 13, 14	Surficial soil			
	8, 10, 12, 13, 14	Subsurface soil			
	8, 10, 12, 13, 14	Groundwater			
	8, 10	Surface water/sediment			
	8, 12, 13	Asphalt/concrete			
	8	Vadose zone			
	9, 10	Soil samples of test pits/tank inspections, pressure tests	Collect information on potential releases and contaminants from tanks.	IV, I	Source characterization
	9, 10	Residue samples/product samples	Collect liquid or sludge for chemical analysis.	IV	Source characterization
	9	Tank wipe samples	Collect radiation data.	II	Source characterization
	9	Soil samples near tanks	Collect information on potential releases and contaminants from tanks.	IV, V for radiation	Source characterization

3+/1/10

TABLE 2-2
INTEGRATED OPERABLE UNITS
SUMMARY OF DQOs FOR OUs 8, 9, 10, 12, 13, and 14
ROCKY FLATS PLANT

SPECIFIC OBJECTIVE (DATA NEED)	OPERABLE UNIT(S)	DATA TYPE	SAMPLING AND ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
Characterize the environmental setting of each IHSS • Subsurface statigraphy and characteristics of subsurface materials • Depth to groundwater • Groundwater flow regime • Vadose water flow regime	8, 10, 12, 13, 14	Geologic description	Evaluate applicability of existing data from adjoining IHSSs, drill boreholes, and log subsurface materials.	I	Soil and subsurface characterization
	8, 10, 12, 13, 14	Water-level data	Water level data from existing wells, piezometers, and newly installed boreholes.	I	Subsurface characterization
	8, 10, 12, 13, 14	Water-level data and aquifer tests	Evaluate applicability of new aquifer data from adjoining OUs.	I	Aquifer characterization
	8, 12, 13	Soil moisture data and matrix potential measurement	Evaluate applicabilty of new vadose zone data from STP vadose characterization.	I	Source/soil characterization
	10	Soil moisture levels and matrix potential measurements	Install tensiometers or equivalent at select IHSSs.	I	Source/soil characterization
Characterize the nature and extent of contamination • Affected media including location, concentration, type, physical state, and quantity of contaminants	8, 10, 12, 13	Subsurface water, soil, vadose, and groundwater data	For specified IHSS, conduct HPGe/NaI and soil-gas surveys, collect surface soil, subsurface soil, groundwater, surface water, sediment, and asphalt samples, as necessary.	II for HPGe radiation survey, IV for nonradiation, V for radiation	Site characterization. Evaluation for remedial alternatives. Risk assessment.
	14	Geophysical data	Conduct borehole clearance geophysical survey, at appropriate IHSSs.	II	Source/soil characterization

TABLE 2-2
INTEGRATED OPERABLE UNITS
SUMMARY OF DQOs FOR OUs 8, 9, 10, 12, 13, and 14
ROCKY FLATS PLANT

SPECIFIC OBJECTIVE (DATA NEED)	OPERABLE UNIT(S)	DATA TYPE	SAMPLING AND ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
Assess fate and transport of contaminants	8	Surface water/sediment, soil aquifer characteristics	Leachability tests, soil tensiometer, surface water, and groundwater conditions.	I - III	Risk assessment
	8	Soil physical parameters	TOC, pH, grain size, bulk density, soil moisture content.		
	10	Soil physical parameters	TOC, permeability test, porosity, moisture content, sieve analysis.	I	Source/soil characterization
	12, 13	Soil and aquifer physical parameters Surface water/sediment	Evaluate applicabilty of new aquifer data from adjoining OUs and vadose zone data from STP vadose characterization.	I	Risk assessment. Site characterization.
	14	Surficial soil physical properties	Collect and analyze soil samples for physical characteristics	I, II	Evaluation of remedial alternatives
Assess risk to human health and environment	8, 9, 10, 12, 13, 14	All	Synthesis of RFI/RI data.	I	Risk assessment
Identify applicable remedial measures	8, 9, 10, 12, 13, 14	All	Synthesis of RFI/RI data.	I	Evaluation of remedial alternatives
	8	Treatability, bench scale	Collect and analyze pretreatment samples to determine effectiveness of alternatives.	I, II	Evaluation of remedial alternatives

HPGe = high purity germanium
IHSS = individual hazard substance sites
NA = not applicable
NaI = sodium iodide
OU = operable unit
RFI = remedial field investigation
RI = remedial investigation
STP = sewage treatment plant
TOC = total organic compound

TABLE 2-3

SUMMARY OF GEOGRAPHICALLY OVERLAPPING IHSSs OPERABLE UNIT 8 ROCKY FLATS PLANT

CASE NUMBER	GEOGRAPHICALLY OVERLAPPING OU/IHSSs	OVERLAPPING NONINTRUSIVE SAMPLE ACTIVITY	RECOMMENDATIONS (FOR OVERLAPPING AREAS ONLY)
1	OU8, 172 and OU13, 190	None	Conduct sampling for each IHSS as described in respective Work Plans.
2	OU8, 172 and OU13, 117.3	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
3	OU8, 172 and OU13, 152	None	Conduct sampling for each IHSS as described in respective Work Plans.
4	OU8, 172 and OU13, 186	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
5	OU8, all IHSS and OU9 Pipelines	Radiation Survey	Use OU8 radiation survey results to assist scoping the OU9 radiation surveys.
6	OU8, 150.2 and OU14, 162	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
7	OU8, 172 and OU14, 162	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
8	OU8, 172 and OU8, 150.2 and 150.1	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.

TABLE 2-4

SUMMARY OF GEOGRAPHICALLY OVERLAPPING IHSSs OPERABLE UNIT 10 ROCKY FLATS PLANT

CASE NUMBER	GEOGRAPHICALLY OVERLAPPING OU/IHSSs	OVERLAPPING NONINTRUSIVE SAMPLE ACTIVITY	RECOMMENDATIONS (FOR OVERLAPPING AREAS ONLY)
1	OU10, 176 and OU9 Pipeline	Radiation Survey	Use results from IHSS 176 to assist scoping radiation surveys for OU9.
2	OU10, 129 and OU13, 190	None	Conduct sampling for each IHSS as proposed in respective Work Plans.
3	OU10, 129 and OU12, 187	None	Conduct sampling for each IHSS as proposed in respective Work Plans.
4	OU10, 170 and OU10 174 a, b	Radiation Survey Soil Gas Survey Surface Soil Sampling	Work Plan has accounted for sample area overlap. No changes to Work Plan are recommended.
5	OU10, 205 and OU12, 157.2	Surface Soil Sampling	Surface soil sampling for IHSS 205 is dependent on visual inspection. Therefore, no changes to Work Plan are recommended.
6	OU10, 207 and OU12, 157.2	None	Conduct sampling for each IHSS as proposed in respective Work Plans.
7	OU10, 208 and OU12, 157.2	None	Conduct sampling for each IHSS as proposed in respective Work Plans.
8	OU10, 182 and OU12, 157.2	Soil Gas Survey	Delete soil-gas survey points from OU12, IHSS 157.2 soil gas survey. Use results from IHSS 182 (Figure 2-1).

TABLE 2-5

SUMMARY OF GEOGRAPHICALLY OVERLAPPING IHSSs OPERABLE UNIT 12 ROCKY FLATS PLANT

CASE NUMBER	GEOGRAPHICALLY OVERLAPPING OU/IHSSs	OVERLAPPING NONINTRUSIVE SAMPLE ACTIVITY	RECOMMENDATIONS (FOR OVERLAPPING AREAS ONLY)
1	OU12, 120.2 and OU14, 161	Soil Gas Sampling	Delete two soil gas survey points from northeast corner of IHSS 161 soil gas survey grid (Figure 2-2). Use results from IHSS 120.2.
2	OU12, 187 and OU10, 129	None	Conduct sampling for each IHSS as described in respective Work Plans.
3	OU12, 157.2 and OU10, 205	Surface Soil Sampling	Surface soil sample location for IHSS 205 is dependent on visual inspection. Therefore, no changes recommended.
4	OU12, 157.2 and OU10, 207	None	Conduct sampling for each IHSS as described in respective Work Plans.
5	OU12, 157.2 and OU10, 208	None	Conduct sampling for each IHSS as described in respective Work Plans.
6	OU12, 157.2 and OU10, 182	Soil Gas Survey	Delete soil gas survey point in IHSS 157.2 from OU12 soil gas survey (Figure 2-1). Use results from IHSS 182.
7	OU12, 187 and OU13, 157.1	None	Conduct sampling for each IHSS as described in respective Work Plans.
8	OU12, 157.2 and OU14, 161	None	Conduct sampling for each IHSS as described in respective Work Plans.
9	OU12, 157.2 and OU12, 136.2	None	Conduct sampling for each IHSS as described in OU12 Work Plans.
10	OU12, 157.2 and OU12, 189	None	Conduct sampling for each IHSS as described in OU12 Work Plans.
11	OU12, 157.2 and OU12, 120.2	None	Conduct sampling for each IHSS as described in OU12 Work Plans.
12	OU12, 157.2 and OU12, 116.1	None	Conduct sampling for each IHSS as described in OU12 Work Plans.
13	OU12, 157.2 and OU12, 136.1	None	Conduct sampling for each IHSS as described in OU12 Work Plans.
14	OU12, 157.2 and OU12, 116.2	None	Conduct sampling for each IHSS as described in OU12 Work Plans.
15	OU12, 187 and OU13, 190	None	Conduct sampling for each IHSS as described in respective Work Plans.

TABLE 2-6

SUMMARY OF GEOGRAPHICALLY OVERLAPPING IHSSs OPERABLE UNIT 13 ROCKY FLATS PLANT

CASE NUMBER	GEOGRAPHICALLY OVERLAPPING OU/IHSSs	OVERLAPPING NONINTRUSIVE SAMPLE ACTIVITY	RECOMMENDATIONS (FOR OVERLAPPING AREAS ONLY)
1	OU13, 190 and OU8, 172	None	Conduct sampling for each IHSS as described in respective Work Plans.
2	OU13, 117.3 and OU8, 172	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
3	OU13, 117.3 and OU13, 190	None	Conduct sampling for each IHSS as described in respective Work Plan.
4	OU13, 152 and OU13, 190	None	Conduct sampling for each IHSS as described in respective Work Plan.
5	OU13, 190 and OU14, 162	None	Conduct sampling for each IHSS as described in respective Work Plan.
6	OU13, 190 and OU9 Pipeline	None	Conduct sampling for each IHSS as described in respective Work Plans.
7	OU13, 152 and OU13, 190	None	Conduct sampling for each IHSS as described in respective Work Plans.
8	OU13, 152 and OU8, 172	None	Conduct sampling for each IHSS as described in respective Work Plans.
9	OU13, 190 and OU8, 172	None	Conduct sampling as proposed in respective Work Plans.
10	OU13, 190 and OU13, 157.1	None	Conduct sampling for each IHSS as described in respective Work Plans.
11	OU13, 190 and OU13, 191	None	Conduct sampling for each IHSS as described in respective Work Plans.
12	OU13, 190 and OU10, 129	None	Conduct sampling for each IHSS as described in respective Work Plans.

TABLE 2-6 (continued)

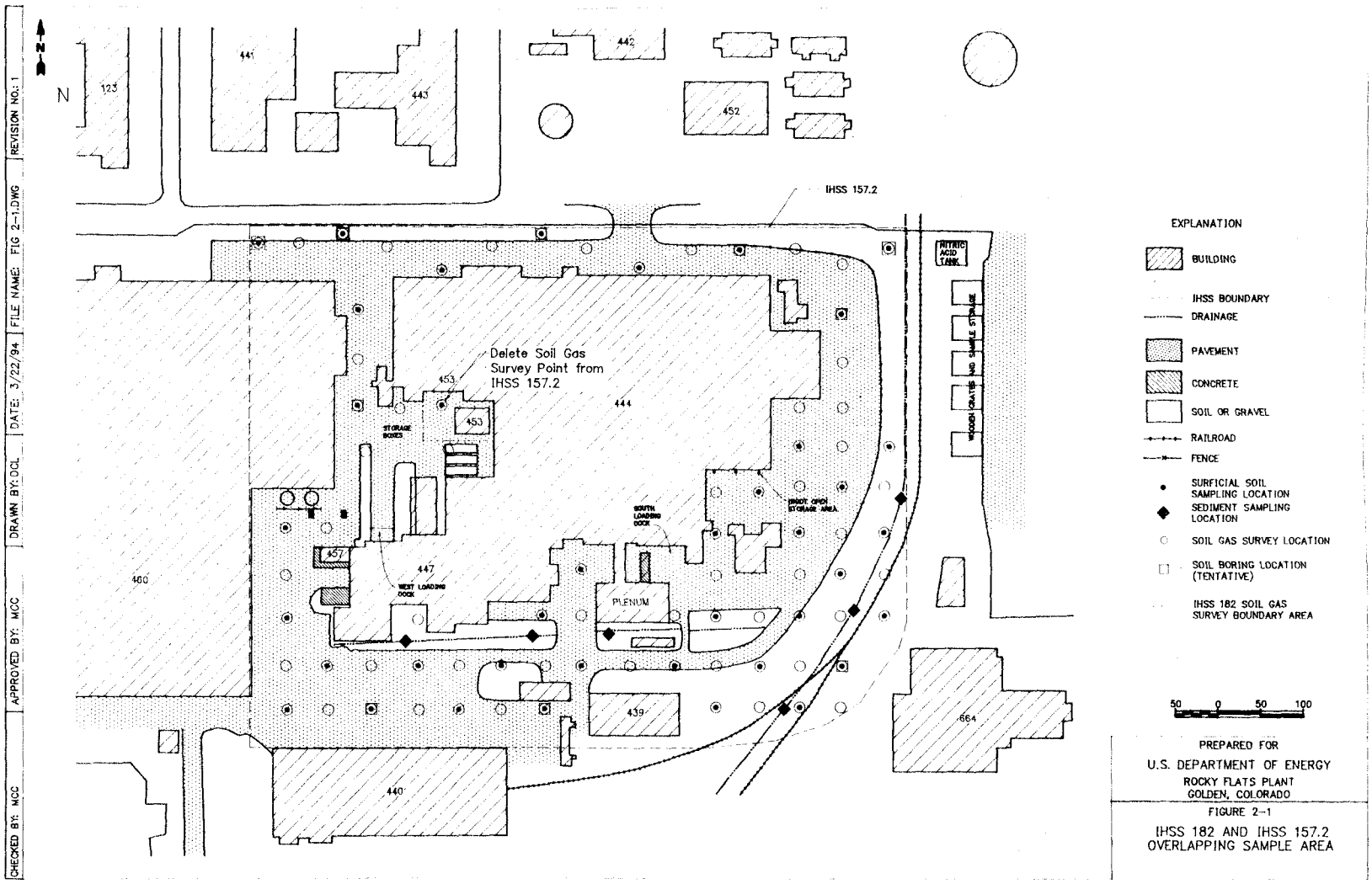
SUMMARY OF GEOGRAPHICALLY OVERLAPPING IHSSs OPERABLE UNIT 13 ROCKY FLATS PLANT

CASE NUMBER	GEOGRAPHICALLY OVERLAPPING OU/IHSSs	OVERLAPPING NONINTRUSIVE SAMPLE ACTIVITY	RECOMMENDATIONS (FOR OVERLAPPING AREAS ONLY)
13	OU13, 186 and OU8, 172	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
14	OU13, 186 and OU14, 156.1	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
15	OU13, 186 and OU13, 117.1	Soil Gas Survey Radiation Survey	Soil gas survey will be conducted under IHSS 117.1 in overlapping area. Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized by the subcontractor. No further recommendations provided at this time.
16	OU13, 186 and OU13, 197	None	Conduct sampling as proposed in respective Work Plans.
17	OU13, 117.1 and OU13, 197	None	Since CDH and EPA have requested sampling activities be coordinated with IHSS 117.1, no changes to OU13 Work Plan are recommended.
18	OU13, 117.2 and OU13, 169	None	No sample activities proposed for IHSS 169.
19	OU13, 128 and OU13, 171	Soil Gas Survey Radiation Survey	No changes recommended. Work Plan sampling activities account for IHSS overlap.
20	OU13, 148 and OU9 Pipeline	Radiation Survey	Use results from IHSS 148 radiation survey to supplement the scoping for OU9 radiation surveys.
21	OU13, 157.1 and OU12, 187	None	Conduct sampling as proposed in respective Work Plans.

TABLE 2-7

SUMMARY OF GEOGRAPHICALLY OVERLAPPING IHSSs OPERABLE UNIT 14 ROCKY FLATS PLANT

CASE NUMBER	GEOGRAPHICALLY OVERLAPPING OU/IHSSs	OVERLAPPING NONINTRUSIVE SAMPLE ACTIVITY	RECOMMENDATIONS (FOR OVERLAPPING AREAS ONLY)
1	OU14, 162 and OU8, 172	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
2	OU14 IHSS and OU9 Pipelines	Radiation Surveys	Use results from OU14 radiation surveys to assist in scoping the radiation surveys related to OU9.
3	OU14, 162 and OU8, 150.2	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
4	OU14, 162 and OU13, 190	None	Conduct sampling as proposed in respective Work Plans.
5	OU14, 156.1 and OU13, 186	Radiation Survey	Radiation surveys for both IHSSs have been completed. Overlapping sample locations have been minimized. No further recommendations provided at this time.
6	OU14, 161 and OU12, 157.2	None	Conduct sampling as proposed in respective Work Plans.
7	OU14, 161 and OU12, 120.2	Soil Gas Sampling	Delete 2 soil gas survey points from northeast corner of IHSS 161 soil gas survey grid (Figure 2-2). Use results from IHSS 120.2.
8	OU14, 162 and OU9, 123.2 (formerly OU8, 150.5)	Radiation Survey	Use results from IHSS 162 radiation survey to assist in scoping the radiation surveys proposed under OU9.


CHECKED BY: MCC
APPROVED BY: MCC
DRAWN BY: DCL
DATE: 3/22/94
FILE NAME: FIG 2-1.DWG
REVISION NO.: 1
N
123
441
443
442
452
IHSS 157.2
Delete Soil Gas Survey Point from IHSS 157.2
453
444
460
457
447
439
440
664
NITRIC ACID TANK
WOODEN CRATES AND SAMPLE STORAGE
STORAGE BOXES
SOUTH LOADING DOCK
WEST LOADING DOCK
PLENUM
EXPLANATION
BUILDING
IHSS BOUNDARY
DRAINAGE
PAVEMENT
CONCRETE
SOIL OR GRAVEL
RAILROAD
FENCE
SURFICIAL SOIL SAMPLING LOCATION
SEDIMENT SAMPLING LOCATION
SOIL GAS SURVEY LOCATION
SOIL BORING LOCATION (TENTATIVE)
IHSS 182 SOIL GAS SURVEY BOUNDARY AREA
50 0 50 100
PREPARED FOR
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS PLANT
GOLDEN, COLORADO
FIGURE 2-1
IHSS 182 AND IHSS 157.2
OVERLAPPING SAMPLE AREA

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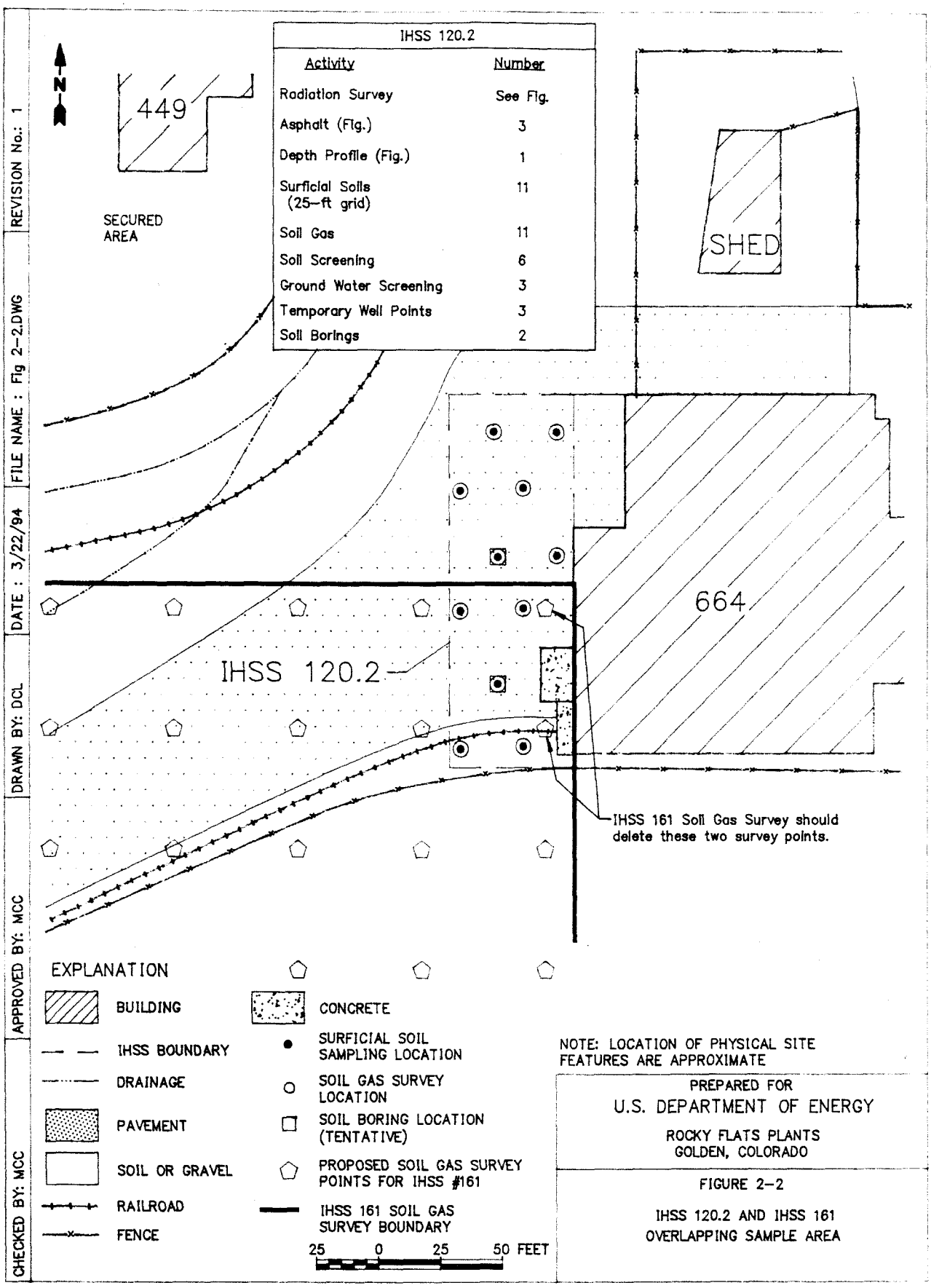
IHSS 120.2
Activity | Number
Radiation Survey | See Fig.
Asphalt (Fig.) | 3
Depth Profile (Fig.) | 1
Surficial Soils (25-ft grid) | 11
Soil Gas | 11
Soil Screening | 6
Ground Water Screening | 3
Temporary Well Points | 3
Soil Borings | 2
N
449
SECURED AREA
SHED
664
IHSS 120.2
IHSS 161 Soil Gas Survey should delete these two survey points.
EXPLANATION
BUILDING
CONCRETE
IHSS BOUNDARY
SURFICIAL SOIL SAMPLING LOCATION
DRAINAGE
SOIL GAS SURVEY LOCATION
PAVEMENT
SOIL BORING LOCATION (TENTATIVE)
SOIL OR GRAVEL
PROPOSED SOIL GAS SURVEY POINTS FOR IHSS #161
RAILROAD
IHSS 161 SOIL GAS SURVEY BOUNDARY
FENCE
25 0 25 50 FEET
NOTE: LOCATION OF PHYSICAL SITE FEATURES ARE APPROXIMATE
PREPARED FOR
U.S. DEPARTMENT OF ENERGY
ROCKY FLATS PLANTS
GOLDEN, COLORADO
FIGURE 2-2
IHSS 120.2 AND IHSS 161
OVERLAPPING SAMPLE AREA
REVISION No.: 1
FILE NAME : Fig 2-2.DWG
DATE : 3/22/94
DRAWN BY: DCL
APPROVED BY: MCC
CHECKED BY: MCC

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An overlapping sampling activity was identified as a common field sampling effort proposed within the same area shared by two separate IHSSs. The overlapping sampling effort shared a common media (e.g., soil gas), similar sample location spacings, and similar proposed analytical suite. The most common overlapping sampling activities identified during this analysis included surface radiation surveys and soil-gas surveys. Nonintrusive sampling activities such as surface water/sediment sampling, surface soil sampling, and vertical soil profiling were not found to overlap with other IHSS sample locations during this evaluation.

Of the common overlapping sampling activities (e.g., soil gas and surface radiological surveys), no changes have been proposed for the surface radiation surveys proposed at the Integrated OU IHSSs. At the time the draft version of this report was prepared, the surface radiological surveys have been performed for all of the Integrated OUs except OU9. The surface radiological surveys were performed by EG&G in such a manner as to significantly reduce the overlapping sample areas, thus minimizing the data redundancy among overlapping IHSSs. The results of these surveys will be used to assist the scope of the radiation surveys to be proposed for the OU9 IHSSs. As a result, the changes recommended in Tables 2-3 through 2-7 focus on redundant soil-gas survey locations. Figures 2-1 and 2-2 illustrate the recommended changes discussed in these tables.

2.7 EVALUATION OF PROPOSED ANALYTICAL PARAMETERS FOR ADJACENT IHSSs

In an effort to fully integrate the industrial area OUs, an evaluation of combining analytical suites for adjacent nonintrusive sampling activities was conducted. The objective of combining the analytical suites for the common and adjacent sampling activities was twofold: (1) collect data from adjacent IHSSs (e.g., located within 100 feet of other IHSSs) during Phase I RFI/RI

sampling activities to assist in scoping the work to be performed during the Phase II intrusive activities, and (2) to assist in the contaminant transport analysis for the respective IHSSs.

This "adjacent analysis" was conducted by first identifying all IHSSs located within 100 feet of each other (Plate 1). The nonintrusive sampling activities proposed for the respective IHSSs were then evaluated to determine whether common sampling activities are to be conducted for these adjacent IHSSs. For example, if adjacent IHSSs contain proposed surface soil sampling locations located within 100 feet of each other, then the analytical suite proposed for each IHHS would be combined to form one common analytical suite to be conducted on all surface soil samples collected within the adjacent IHSSs. This adjacent analysis was performed for all nonintrusive sampling activities proposed for the Integrated OUs.

Results of this adjacent analysis found that recommendations regarding the combination of analytical suites could only be applied to adjacent surface soil sample locations. Other nonintrusive sampling activities such as soil-gas surveys and surface water/sediment sampling locations that were adjacent to each other already share common analytical suites. For example, the surface water/sediment sampling locations proposed for OU12 at IHSSs 116.2, 136.2, and 157.2 are to be analyzed for a common analytical suite (volatile organics, radionuclides, metals, and polycholorinated biphenyls [PCBs]). Surface radiation surveys also shared common analytical parameters. Therefore, the adjacent analysis applies only to adjacent surface soil samples located among the Integrated OUs. Table 2-8 and Figures 2-3 through 2-18 summarize the adjacent analysis recommendations for these surface soil samples.

TABLE 2-8

ANALYTICAL RECOMMENDATIONS
ADJACENT IHSS SURFACE SOIL SAMPLE LOCATIONS
INDUSTRIAL AREA OPERABLE UNITS
ROCKY FLATS PLANT

ADJACENT OU/IHSS WITH PROPOSED ANALYTICAL SUITE		ANALYTICAL RECOMMENDATIONS FOR ADJACENT SURFACE SOIL SAMPLE LOCATIONS
OU8	OU10	
IHSS 135 Total chromium Tritium	**IHSS 206** TAL metals Tritium	Add TAL metal analysis to IHSS 135. Test for all TAL metals at IHSS 135 instead of only for total chromium.
IHSS 151 TPH-diesel	**IHSS 206** TAL metals Tritium	Add TPH-diesel analysis to IHSS 206. Add TAL metal and tritium analyses to IHSS 151.
OU8	OU8	
IHSS 151 TPH-diesel	**IHSS 135** Total chromium Tritium	Add TPH-diesel analysis to IHSS 135. Add total chromium and tritium analyses to IHSS 151.
IHSS 138 Total chromium	**IHSS 150.6 and 150.8** TAL metals Semi-VOA	Add semi-volatile analyses to IHSS 138. Test for TAL metals instead of total chromium at IHSS 138.
IHSS 144(N) Samples collected east of Bldg. 701	**IHSS 139.2** **IHSS 139.1(S)**	For all surface soil samples collected in these areas, conduct pH, semi-VOA, TAL metals, and nitrate analyses (Figure 2-3).
IHSS 139.1(S) pH	**IHSS 137** Total chromium	Add total chromium analysis to IHSS 139.1(S). Add pH analysis to IHSS 137 surface soil samples collected within 100 feet of IHSS 139.1 (S) boundaries (Figure 2-3).
IHSS 139.1(N) pH	**IHSS 163.1** TPH TAL metals Nitrate	Add pH analysis to IHSS 163.1. Add TPH, TAL metals, and nitrate analyses to IHSS 139.1(N).
OU9	OU12	
Tanks T-2 and T-3 TAL Metals VOAs Semi-VOAs Radionuclide PCB	**IHSS 157.20** Lab HPGe	Add PCB analysis for IHSS 157.2 surface soil samples collected within 100 feet of tanks T-2 and T-3 (Figure 2-4). Add volatile and semi-volatile analyses to same samples at IHSS157.2 if samples are collected beneath paved areas.
OU9	OU14	
Tank T-7 TAL metals VOAs Semi-VOAs Radionuclide PCB Pesticide Herbicide	**IHSS 162** Radionuclide	Add volatile, TAL metals, semi-volatile, PCBs, herbicide and pesticide analyses for IHSS 162 surface soil samples collected within 100 feet of tank T-7 (Figure 2-5).

TABLE 2-8 (continued)

ANALYTICAL RECOMMENDATIONS
ADJACENT IHSS SURFACE SOIL SAMPLE LOCATIONS
INDUSTRIAL AREA OPERABLE UNITS
ROCKY FLATS PLANT

ADJACENT OU/IHSS WITH PROPOSED ANALYTICAL SUITE		ANALYTICAL RECOMMENDATIONS FOR ADJACENT SURFACE SOIL SAMPLE LOCATIONS
OU9	OU14	
Tanks T-21, T-22, and T-27 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 164.2** Radionuclide	Include TAL metals, semi-volatile and volatile analyses to IHSS 164.2 surface soil samples collected within 100 feet of tanks T-21, T-22, and T-27 (Figure 2-6).
OU9	OU8	
Tanks T-9 and T-10 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 144(N)** TAL metals Semi-VOAs	Include volatile and radionuclide analyses for IHSS 144(N) surface soil samples collected within 100 feet of tanks T-9 and T-10 (Figure 2-7).
Tanks T-9 and T-10 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 118.10** TAL metals VOAs Semi-VOAs Radionuclide	Conduct sampling as planned in the respective work plans.
Tanks T-9 and T-10 TAL metals VOA's Semi-VOAs Radionuclide	**IHSS 139.1(S)** pH	Add pH analysis to Tanks T-9 and T-10. Add TAL Metals, VOAs, semi-volatiles, and radionuclide analysis to IHSS 139.1(S) (Figure 2-7).
Tanks T-9 and T-10 TAL metals VOA's Semi-VOAs Radionuclide	**IHSS 139.2** Nitrates pH	Add nitrate and pH analyses to Tanks T-9 and T-10. Add TAL metals, VOAs, semi-volatiles, and radionuclide analyses to IHSS 139.2 (Figure 2-7).
Tanks T-9 and T-10 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 131** Radionuclide	Add TAL metals, volatile, and semi-volatile analyses to IHSS 131 surface soil samples collected within 100 feet of tanks T-9 and T-10 (Figure 2-8).
Tanks T-14, T-15, T-16, and T-17 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 150.30** VOAs Radionuclide	Include TAL metals and semi-volatile analyses to IHSS 150.3 surface soil samples collected within 100 feet of tanks T-14, T-15, T-16, and T-17 (Figure 2-9).

TABLE 2-8 (continued)

ANALYTICAL RECOMMENDATIONS
ADJACENT IHSS SURFACE SOIL SAMPLE LOCATIONS
INDUSTRIAL AREA OPERABLE UNITS
ROCKY FLATS PLANT

ADJACENT OU/IHSS WITH PROPOSED ANALYTICAL SUITE		ANALYTICAL RECOMMENDATIONS FOR ADJACENT SURFACE SOIL SAMPLE LOCATIONS
OU9	OU8	
Tanks T-14, T-15, T-16, and T-17 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 163.1** Radionuclide	Include TAL metals, semi-volatile and volatile analyses to IHSS 164.2 surface soil samples collected within 100 feet of tanks T-21, T-22, and T-27 (Figure 2-10).
Tank T-29 TAL metals VOAs Semi-VOAs Radionuclide	**IHSS 137.00** Total chromium	Add volatile, semi-volatile and radionuclide analyses to IHSS 137 surface soil samples collected within 100 feet of tank T-29 (Figure 2-11). Substitute TAL metal analysis for total chromium analysis for same samples.
OU10	OU13	
IHSS 129 Semi-VOAs TAL metals	**IHSS 157.1** TAL metals	Add semi-volatile analysis to IHSS 157.1.
OU12	OU10	
IHSS 187 pH	**IHSS 129** Semi-VOAs TAL metals	Add pH analysis to IHSS 129. Add semi-volatile and TAL metals analyses to IHSS 187.
IHSS 116.1 TAL metals Lab HPGe	**IHSS 208** pH TAL metals Cyanide	Add Lab HPGe analysis to IHSS 208. Add pH and cyanide analyses to IHSS 116.1.
IHSS 116.1 TAL metals Lab HPGe	**IHSS 182** TAL metals Lab HPGe	No changes recommended.
IHSS 136.1 Lab HPGe TAL metals	**IHSS 208** pH TAL metals Cyanide	Add Lab HPGe analysis to IHSS 208. Add pH and cyanide analyses to IHSS 136.1.
IHSS 157.2 Lab HPGe TAL metals	**IHSS 208** pH TAL metals Cyanide	Add Lab HPGe analysis to IHSS 208. Add pH and cyanide analyses to IHSS 157.2 surface soil samples collected within 100 feet of IHSS 208 boundaries (Figure 2-12).
IHSS 157.2 Lab HPGe TAL metals	**IHSS 182** TAL metals Lab HPGe	No changes recommended.
OU12	OU13	
IHSS 187 pH	**IHSS 157.1** TAL metals	Add TAL metals analysis to IHSS 187. Add pH analysis to IHSS 157.1 surface soil samples located within 100 feet of IHSS 187 boundaries (Figure 2-13).
IHSS 189 pH	**IHSS 117.3** TAL metals	Add TAL metals analysis to IHSS 189. Add pH analysis to IHSS 117.3.

TABLE 2-8 (continued)

ANALYTICAL RECOMMENDATIONS
ADJACENT IHSS SURFACE SOIL SAMPLE LOCATIONS
INDUSTRIAL AREA OPERABLE UNITS
ROCKY FLATS PLANT

ADJACENT OU/IHSS WITH PROPOSED ANALYTICAL SUITE		ANALYTICAL RECOMMENDATIONS FOR ADJACENT SURFACE SOIL SAMPLE LOCATIONS
OU12	OU12	
IHSS 189 pH	**IHSS 136.2** TAL metals Lab HPGe	Add pH analysis to IHSS 136.2. Add TAL metals and Lab HPGe analyses to IHSS 189.
IHSS 120.1 Lab HPGe TAL metals	**IHSS 120.2** Lab HPGe TAL metals	No changes recommended.
IHSS 116.1 Lab HPGe TAL metals	**IHSS 136.1** Lab HPGe TAL metals	No changes recommended.
IHSS 157.2 Lab HPGe TAL metals	**All other OU12 IHSSs in Bldg. 444 Area** Lab HPGe TAL metals	No changes recommended.
IHSS 157.2 Lab HPGe TAL metals	**IHSS 189** pH	Add pH analysis to IHSS 157.2 surface soil samples collected within 100 feet of IHSS 189 boundaries (Figure 2-14). Add Lab HPGe and TAL metals analysis to IHSS 189.
OU13	OU13	
IHSS 128 Lithium Magnesium	**IHSS 171** Lithium Magnesium	No changes recommended.
IHSS 117.1 TAL metals	**IHSS 117.2** TAL metals	No changes recommended.
IHSS 117.2 TAL metals	**IHSS 158** TAL metals	No changes recommended.
IHSS 117.2 TAL metals	**IHSS 117.3** TAL metals	No changes recommended.
OU14	OU13	
IHSS 160 Total uranium Total plutonium Gross alpha Gross beta	**IHSS 117.3** TAL metals	Add TAL metal analysis to IHSS 160 surface scrape soil samples collected within 100 feet of IHSS 117.3 boundaries (see Figure 2-15). Add total uranium, total plutonium, gross alpha, and gross beta analysis to IHSS 117.3 surface soil samples collected within 100 feet of IHSS 160 boundaries (Figure 2-16).
OU14	OU12	
IHSS 160 Total uranium Total plutonium Gross alpha Gross beta	**IHSS 189** pH	Add pH analysis to IHSS 160 surface soil scrapes collected within 100 feet of IHSS 189 boundaries (Figure 2-17). Add all IHSS 160 analytes to IHSS 189 surface soil samples.

TABLE 2-8 (continued)

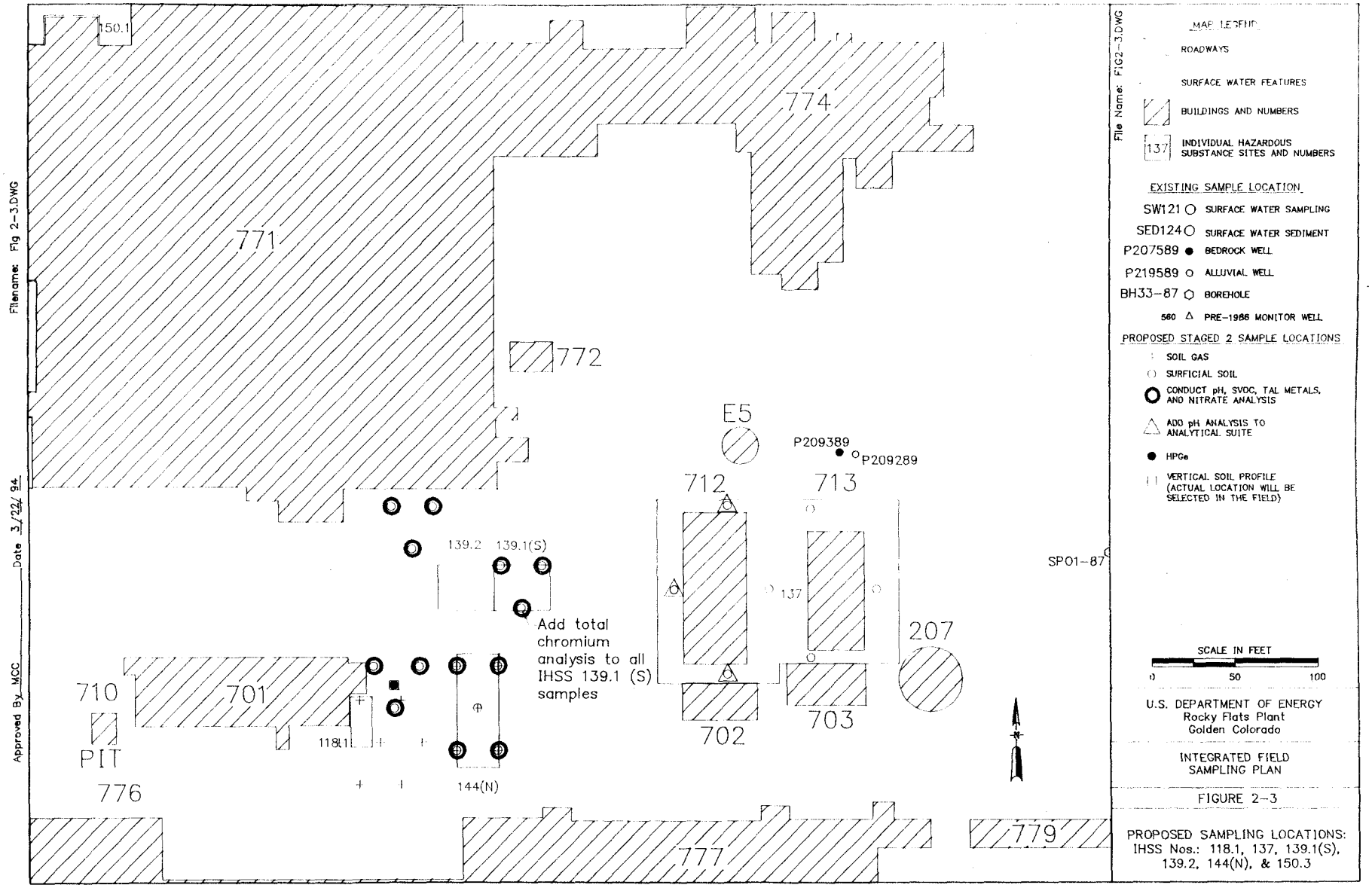
ANALYTICAL RECOMMENDATIONS
ADJACENT IHSS SURFACE SOIL SAMPLE LOCATIONS
INDUSTRIAL AREA OPERABLE UNITS
ROCKY FLATS PLANT

ADJACENT OU/IHSS WITH PROPOSED ANALYTICAL SUITE		ANALYTICAL RECOMMENDATIONS FOR ADJACENT SURFACE SOIL SAMPLE LOCATIONS
OU14	OU12	
IHSS 160 Total uranium Total plutonium Gross alpha Gross beta	**IHSS 157.2** Lab HPGe TAL metals	Add TAL metal analyses to IHSS 160 surface soil scrapes collected within 100 feet of IHSS 157.2 boundaries (Figure 2-18).
IHSS 160 Total uranium Total plutonium Gross alpha Gross beta	**IHSS 120.1** Lab HPGe TAL metals	Add TAL metal analysis to IHSS 160 surface soil scrapes collected within 100 feet of IHSS 120.1 boundaries (Figure 2-18).
OU14	OU14	
IHSS 162 Lab HPGe	**IHSS 131** Total plutonium Total americium Uranium-238 Uranium-235 Uranium-233/234 Gross alpha Gross beta	No changes recommended.
IHSS 162 Lab HPGe	**IHSS 164.3** Lab HPGe	No changes recommended.
IHSS 162 Lab HPGe	**IHSS 164.1** Lab HPGe	No changes recommended.

TPH = Total petroleum hydrocarbons
TAL = Target analyte list
VOA = Volatile organic analysis
PCB = Polychlorinated biphenyls
HPGe = High purity germanium

Radionuclide = Plutonium-239, plutonium-240, uranium-233/234, uranium-235, uranium-238, tritium, total americium, cesium-137, and total strontium.

Lab HPGe = Potassium-40, radium-226, thorium-232, uranium-233/234, uranium-235, uranium-238, cesium-137, americium-241, and plutonium-239.


150.1
774
771
772
E5
P209389
P209289
712
713
139.2
139.1(S)
SP01-87
137
207
Add total chromium analysis to all IHSS 139.1 (S) samples
710
701
PIT
776
118.1
144(N)
702
703
779
777
Filename: Fig 2-3.DWG
Date 3/22/94
Approved By MCC
File Name: FIG2-3.DWG
MAP LEGEND
ROADWAYS
SURFACE WATER FEATURES
BUILDINGS AND NUMBERS
137 INDIVIDUAL HAZARDOUS SUBSTANCE SITES AND NUMBERS
EXISTING SAMPLE LOCATION
SW121 SURFACE WATER SAMPLING
SED124 SURFACE WATER SEDIMENT
P207589 BEDROCK WELL
P219589 ALLUVIAL WELL
BH33-87 BOREHOLE
560 PRE-1986 MONITOR WELL
PROPOSED STAGED 2 SAMPLE LOCATIONS
SOIL GAS
SURFICIAL SOIL
CONDUCT pH, SVOC, TAL METALS, AND NITRATE ANALYSIS
ADD pH ANALYSIS TO ANALYTICAL SUITE
HPGe
VERTICAL SOIL PROFILE (ACTUAL LOCATION WILL BE SELECTED IN THE FIELD)
SCALE IN FEET
0 50 100
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado
INTEGRATED FIELD SAMPLING PLAN
FIGURE 2-3
PROPOSED SAMPLING LOCATIONS:
IHSS Nos.: 118.1, 137, 139.1(S), 139.2, 144(N), & 150.3

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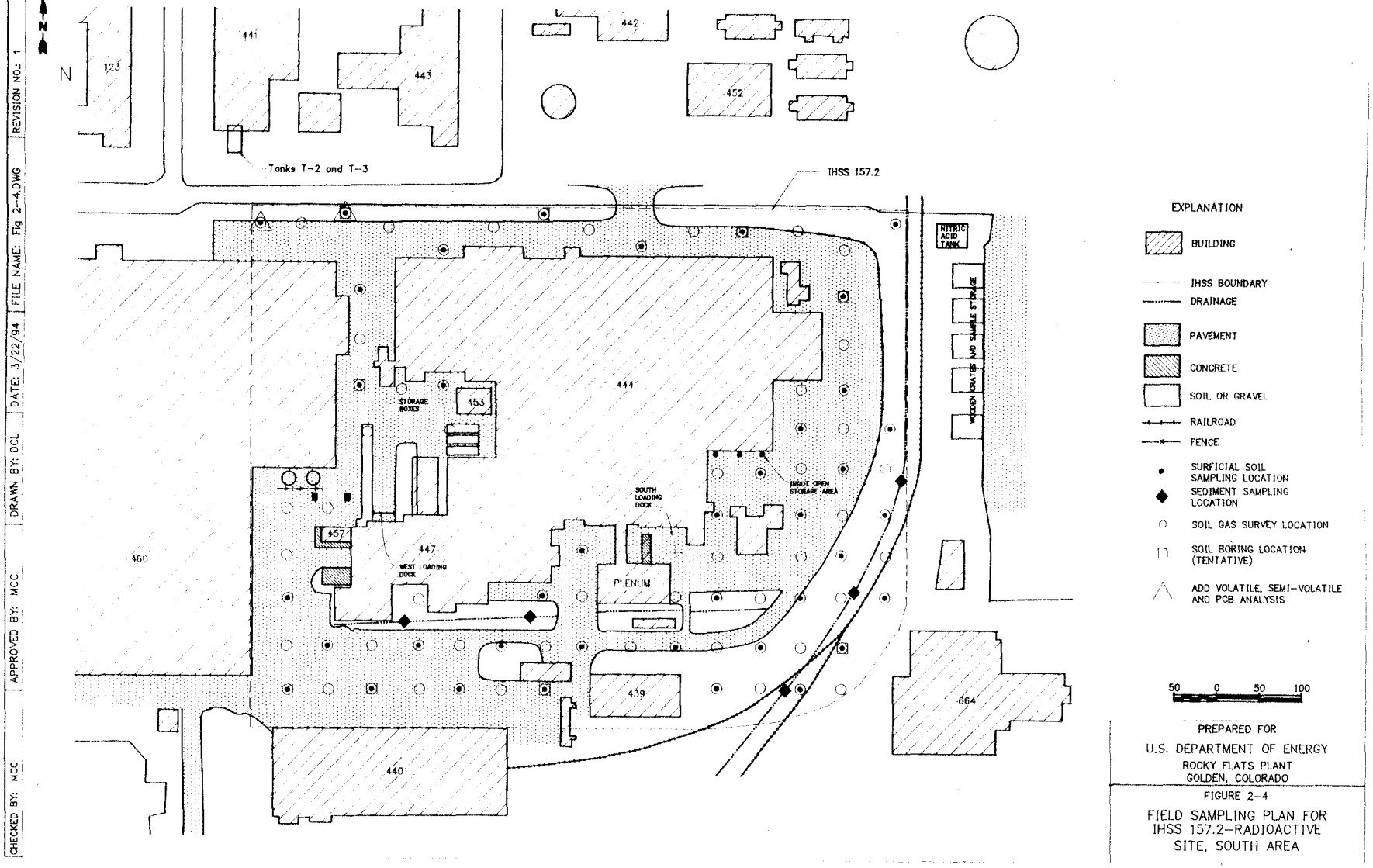
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DATE: 3/22/94
FILE NAME: Fig 2-4.DWG
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123
441
442
443
452
Tanks T-2 and T-3
IHSS 157.2
NITRIC ACID TANK
WOODEN CRATES AND SAMPLE STORAGE
444
453
STORAGE BOXES
457
447
460
WEST LOADING DOCK
SOUTH LOADING DOCK
DRUM OPEN STORAGE AREA
PLENUM
439
664
440
EXPLANATION
BUILDING
IHSS BOUNDARY
DRAINAGE
PAVEMENT
CONCRETE
SOIL OR GRAVEL
RAILROAD
FENCE
SURFICIAL SOIL SAMPLING LOCATION
SEDIMENT SAMPLING LOCATION
SOIL GAS SURVEY LOCATION
SOIL BORING LOCATION (TENTATIVE)
ADD VOLATILE, SEMI-VOLATILE AND PCB ANALYSIS
50 0 50 100
PREPARED FOR
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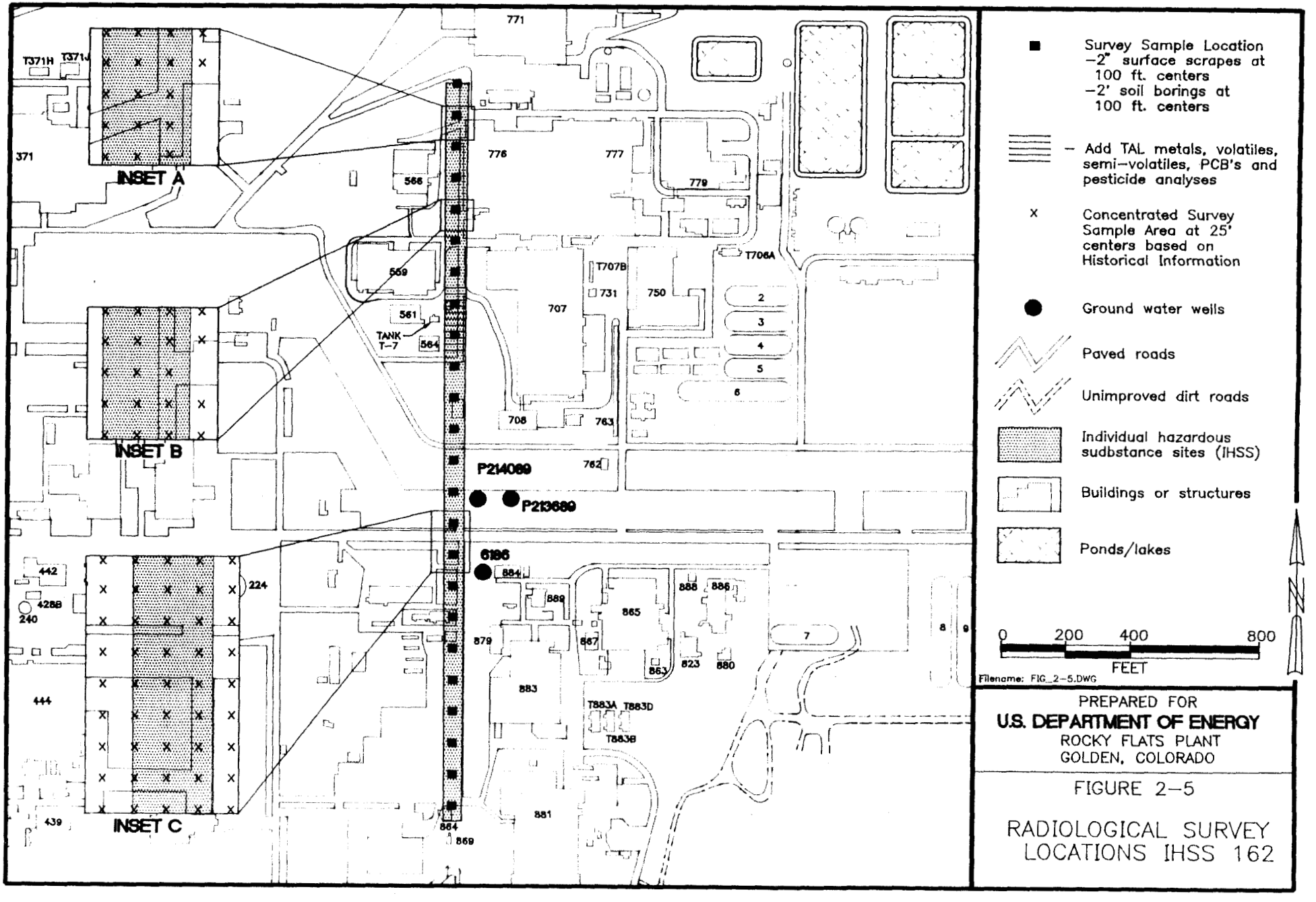
ROCKY FLATS PLANT
GOLDEN, COLORADO
FIGURE 2-4
FIELD SAMPLING PLAN FOR IHSS 157.2-RADIOACTIVE SITE, SOUTH AREA

55/110



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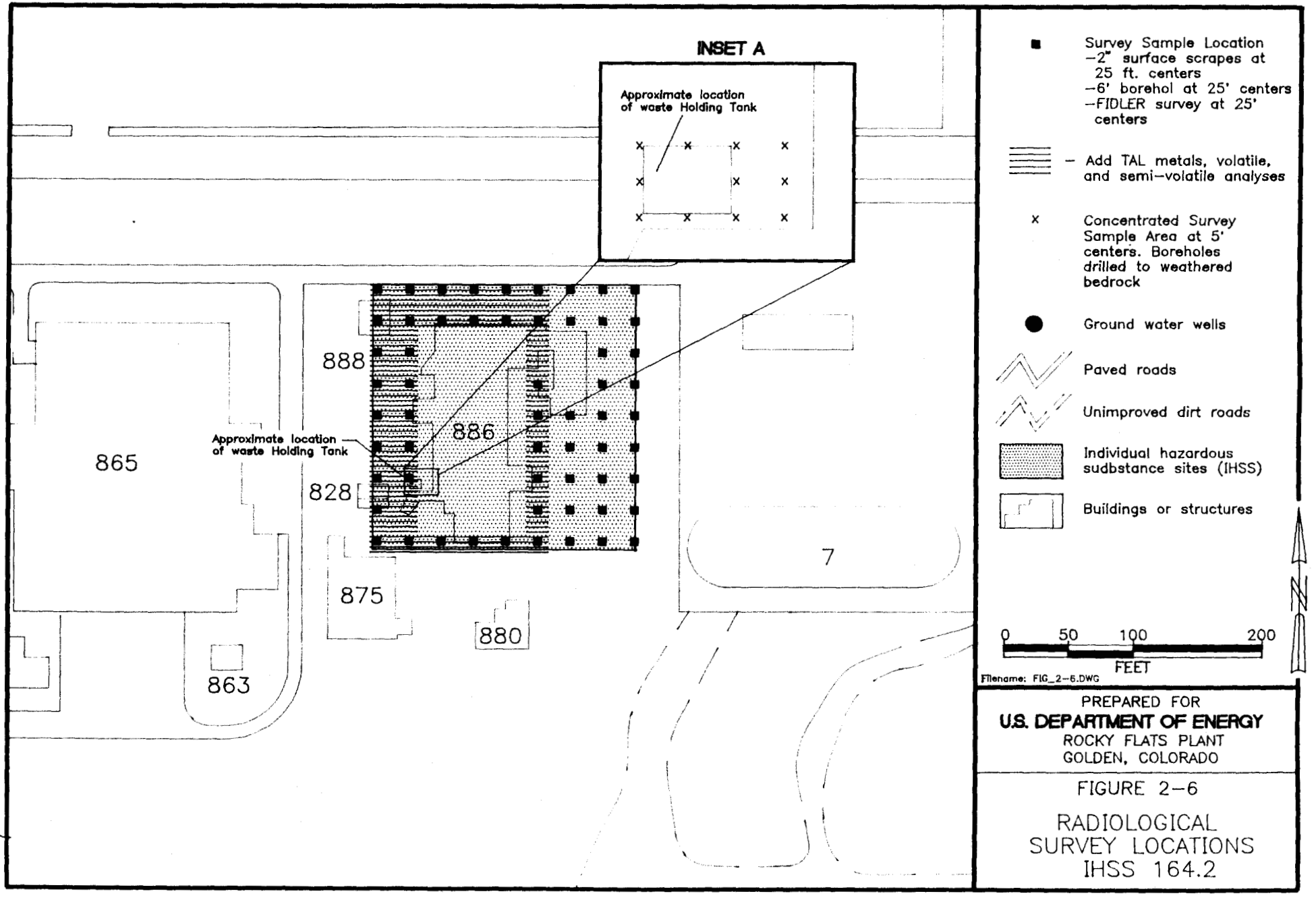
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 2–5

RADIOLOGICAL SURVEY LOCATIONS IHSS 162


INSET A
Approximate location of waste Holding Tank
888
886
865
Approximate location of waste Holding Tank
828
875
880
863
7
Survey Sample Location
–2" surface scrapes at 25 ft. centers
–6' borehol at 25' centers
–FIDLER survey at 25' centers
– Add TAL metals, volatile, and semi–volatile analyses
Concentrated Survey Sample Area at 5' centers. Boreholes drilled to weathered bedrock
Ground water wells
Paved roads
Unimproved dirt roads
Individual hazardous sudbstance sites (IHSS)
Buildings or structures
0 50 100 200
FEET
Filename: FIG_2–6.DWG
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ROCKY FLATS PLANT
GOLDEN, COLORADO
FIGURE 2–6
RADIOLOGICAL SURVEY LOCATIONS
IHSS 164.2

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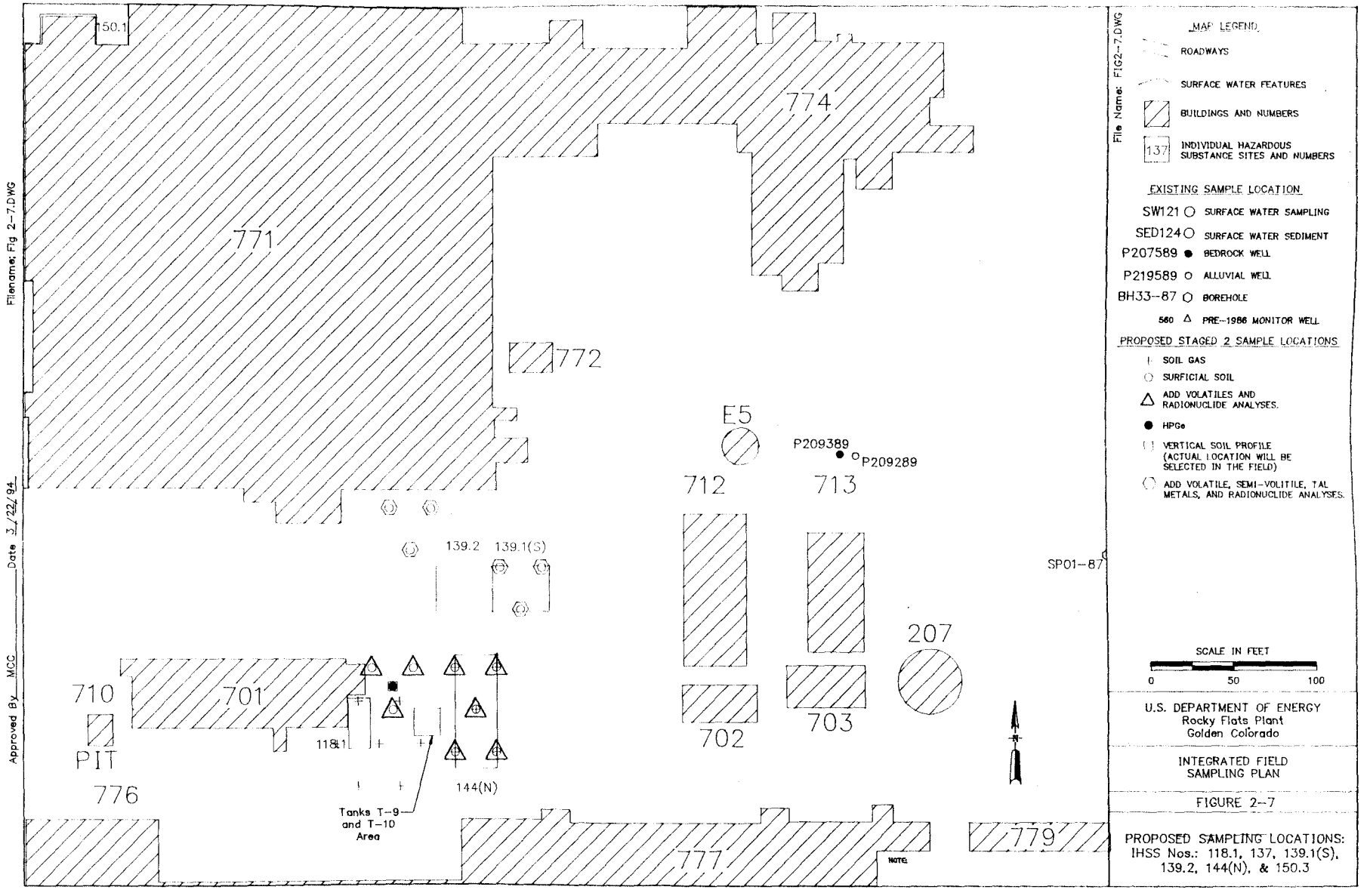
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P209289
712
713
139.2
139.1(S)
SP01-87
207
710
701
PIT
776
118.1
144(N)
Tanks T-9 and T-10 Area
702
703
777
779
NOTE:
Filename: Fig 2-7.DWG
Date 3/22/94
Approved By MCC
File Name: FIG2-7.DWG
MAP LEGEND
ROADWAYS
SURFACE WATER FEATURES
BUILDINGS AND NUMBERS
137 INDIVIDUAL HAZARDOUS SUBSTANCE SITES AND NUMBERS
EXISTING SAMPLE LOCATION
SW121 SURFACE WATER SAMPLING
SED124 SURFACE WATER SEDIMENT
P207589 BEDROCK WELL
P219589 ALLUVIAL WELL
BH33-87 BOREHOLE
560 PRE-1986 MONITOR WELL
PROPOSED STAGED 2 SAMPLE LOCATIONS
SOIL GAS
SURFICIAL SOIL
ADD VOLATILES AND RADIONUCLIDE ANALYSES.
HPGe
VERTICAL SOIL PROFILE (ACTUAL LOCATION WILL BE SELECTED IN THE FIELD)
ADD VOLATILE, SEMI-VOLITILE, TAL METALS, AND RADIONUCLIDE ANALYSES.
SCALE IN FEET
0 50 100
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado
INTEGRATED FIELD SAMPLING PLAN
FIGURE 2-7
PROPOSED SAMPLING LOCATIONS:
IHSS Nos.: 118.1, 137, 139.1(S), 139.2, 144(N), & 150.3

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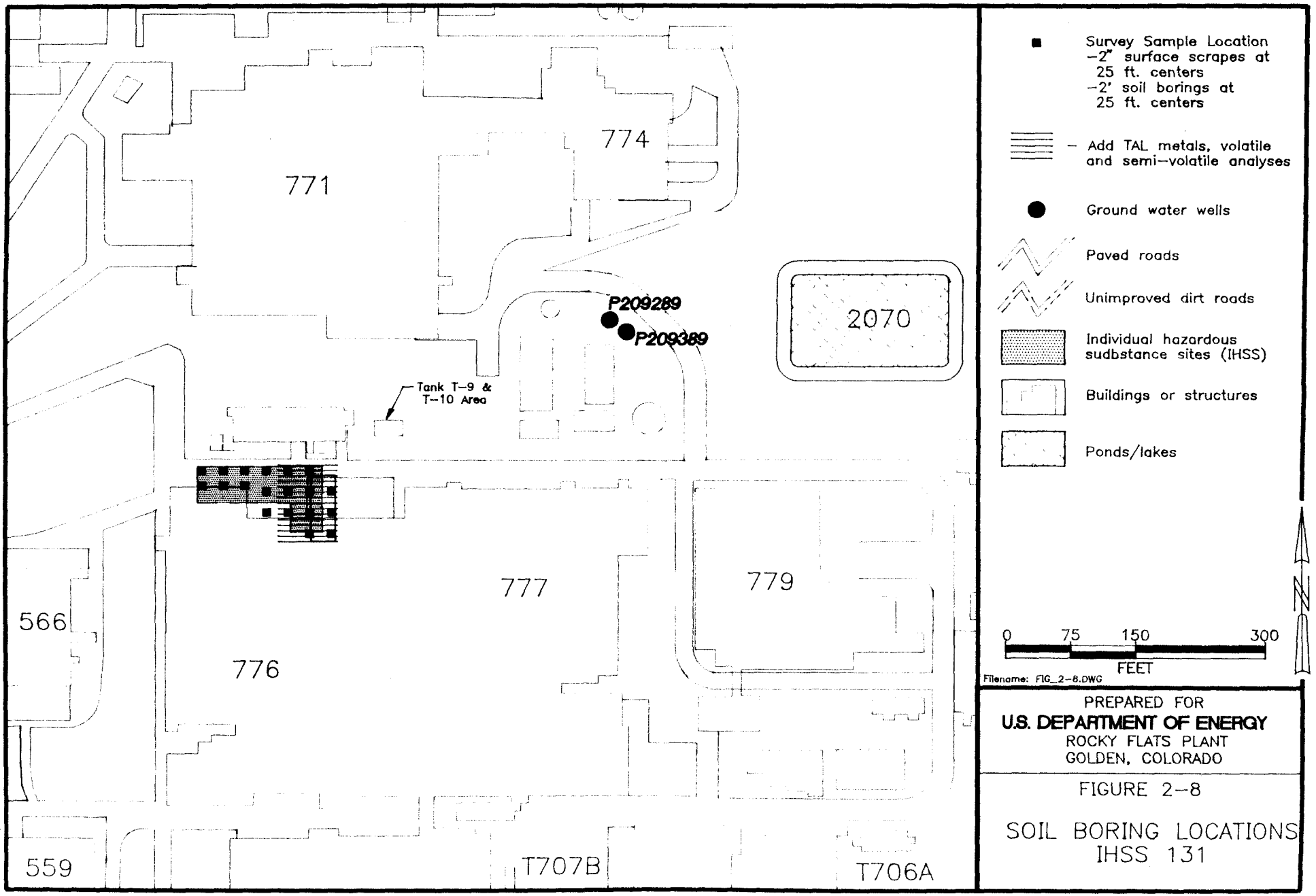

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FIGURE 2-8

SOIL BORING LOCATIONS
IHSS 131

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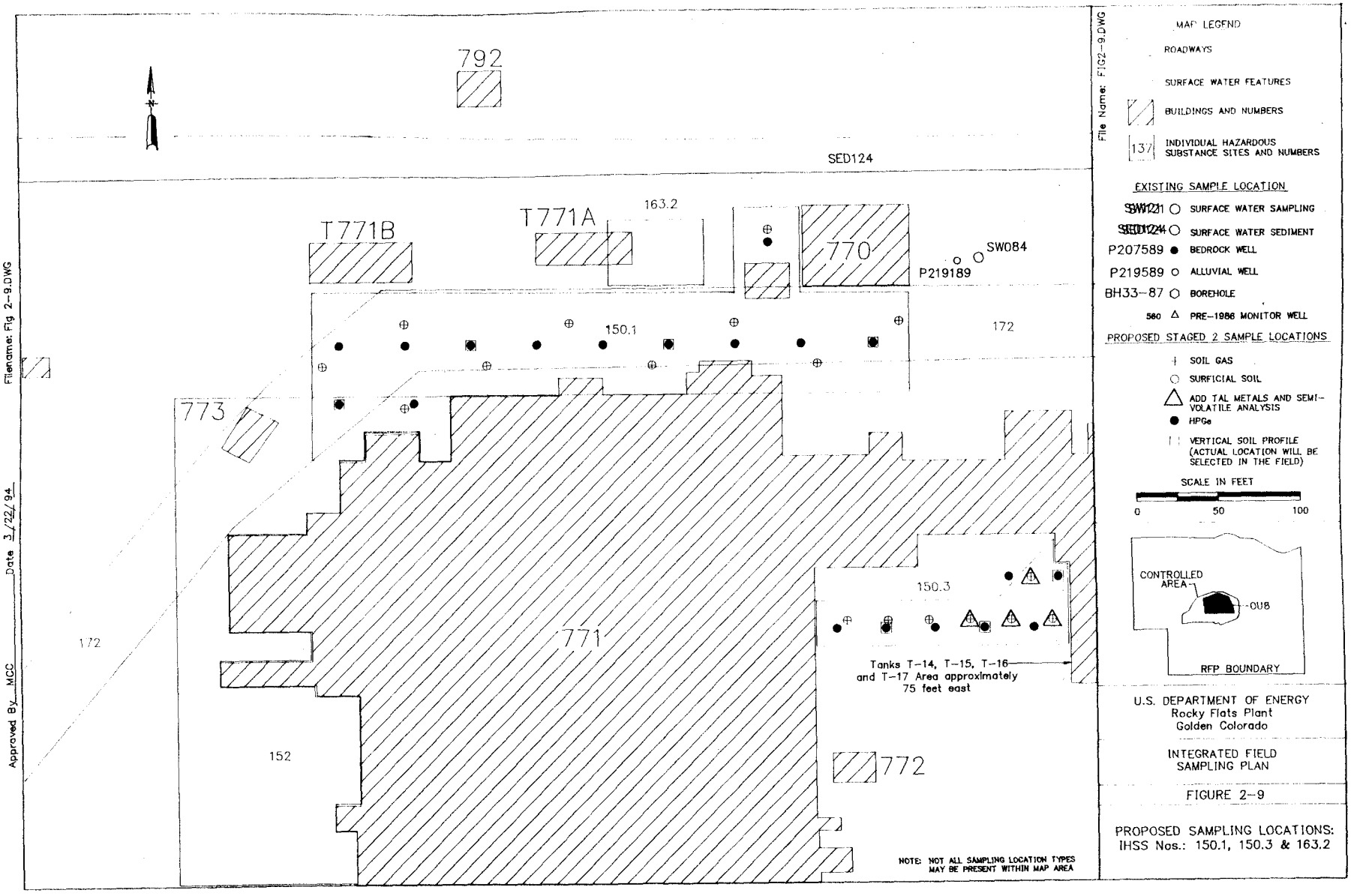
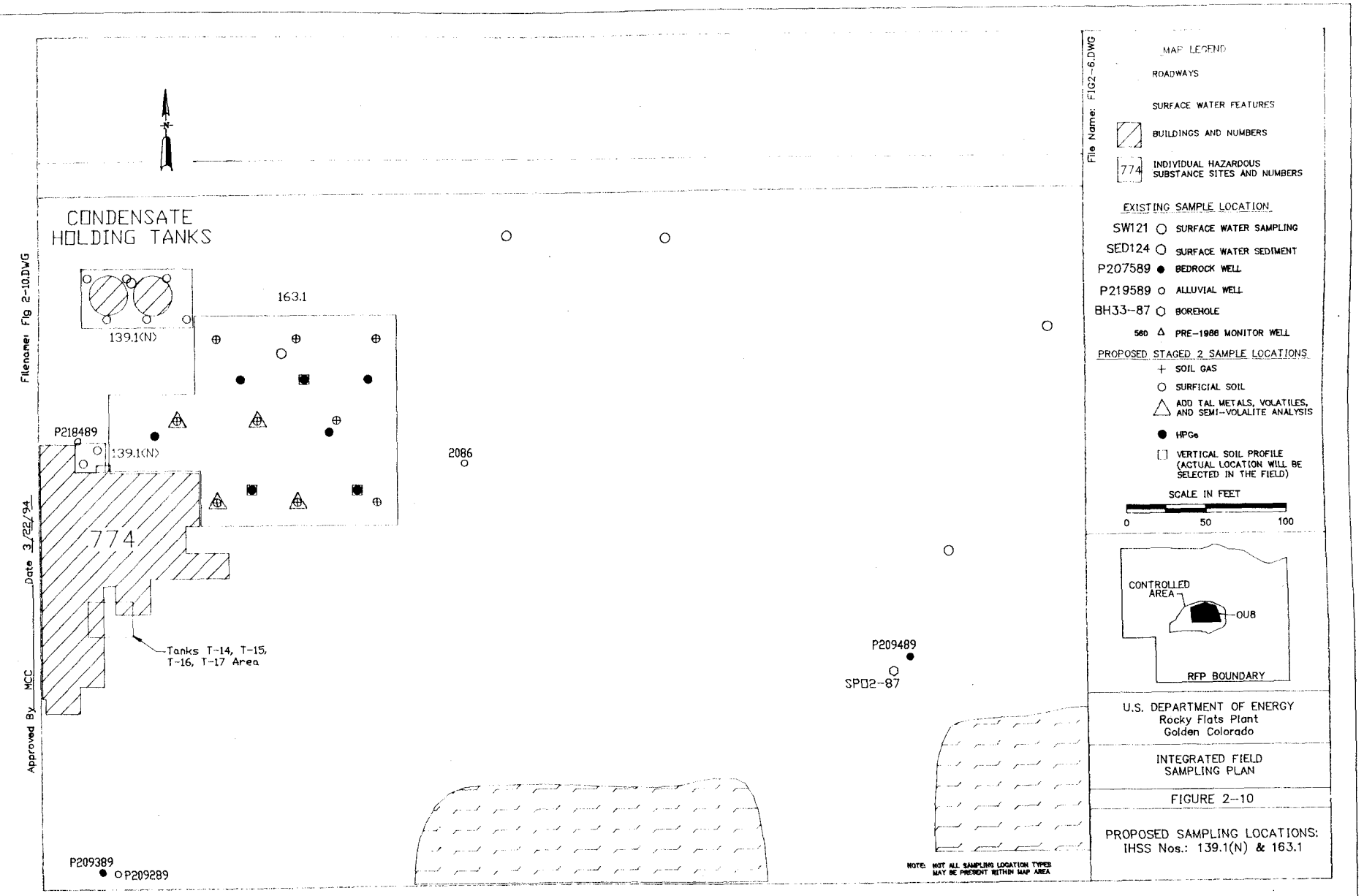

792
SED124
T771B
T771A
163.2
770
SW084
P219189
150.1
172
773
771
150.3
172
Tanks T-14, T-15, T-16
and T-17 Area approximately
75 feet east
152
772
NOTE: NOT ALL SAMPLING LOCATION TYPES MAY BE PRESENT WITHIN MAP AREA
Filename: Fig 2-9.DWG
Date 3/22/94
Approved By MCC
File Name: FIG2-9.DWG
MAP LEGEND
ROADWAYS
SURFACE WATER FEATURES
BUILDINGS AND NUMBERS
137 INDIVIDUAL HAZARDOUS SUBSTANCE SITES AND NUMBERS
EXISTING SAMPLE LOCATION
SW1231 SURFACE WATER SAMPLING
SED1224 SURFACE WATER SEDIMENT
P207589 BEDROCK WELL
P219589 ALLUVIAL WELL
BH33-87 BOREHOLE
560 PRE-1986 MONITOR WELL
PROPOSED STAGED 2 SAMPLE LOCATIONS
SOIL GAS
SURFICIAL SOIL
ADD TAL METALS AND SEMI-VOLATILE ANALYSIS
HPGe
VERTICAL SOIL PROFILE (ACTUAL LOCATION WILL BE SELECTED IN THE FIELD)
SCALE IN FEET
0 50 100
CONTROLLED AREA
OU8
RFP BOUNDARY
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado
INTEGRATED FIELD SAMPLING PLAN
FIGURE 2-9
PROPOSED SAMPLING LOCATIONS:
IHSS Nos.: 150.1, 150.3 & 163.2

64/110



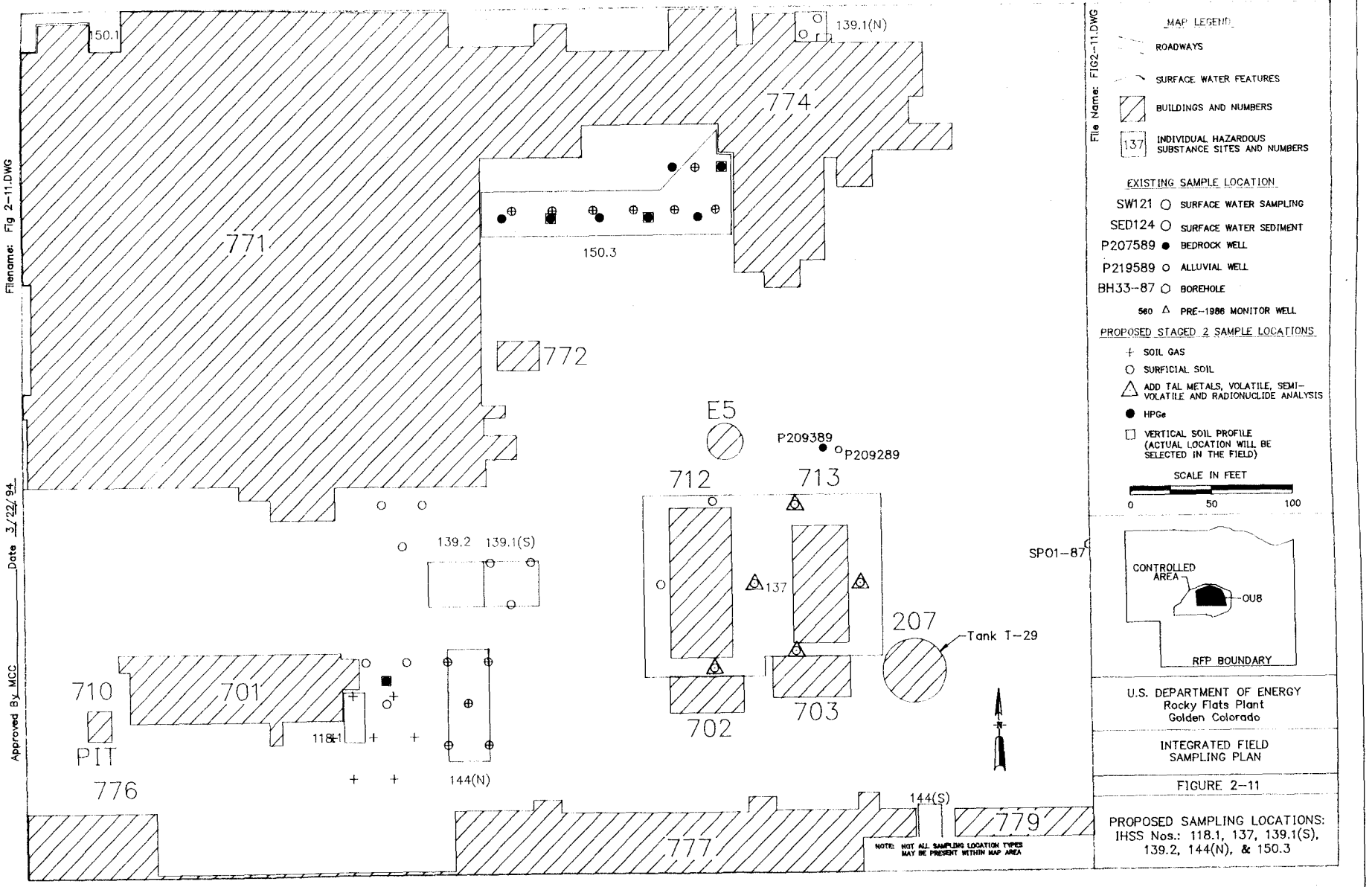
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado

INTEGRATED FIELD SAMPLING PLAN

FIGURE 2-10

PROPOSED SAMPLING LOCATIONS:
IHSS Nos.: 139.1(N) & 163.1

63/170


Filename: Fig 2-11.DWG
Date 3/22/94
Approved By MCC
150.1
139.1(N)
774
771
150.3
772
E5
P209389
P209289
712
713
139.2
139.1(S)
137
207
Tank T-29
SP01-87
710
701
PIT
776
118.1
144(N)
144(S)
702
703
779
777
NOTE: NOT ALL SAMPLING LOCATION TYPES MAY BE PRESENT WITHIN MAP AREA
File Name: FIG2-11.DWG
MAP LEGEND
ROADWAYS
SURFACE WATER FEATURES
BUILDINGS AND NUMBERS
137 INDIVIDUAL HAZARDOUS SUBSTANCE SITES AND NUMBERS
EXISTING SAMPLE LOCATION
SW121 SURFACE WATER SAMPLING
SED124 SURFACE WATER SEDIMENT
P207589 BEDROCK WELL
P219589 ALLUVIAL WELL
BH33-87 BOREHOLE
560 PRE-1986 MONITOR WELL
PROPOSED STAGED 2 SAMPLE LOCATIONS
SOIL GAS
SURFICIAL SOIL
ADD TAL METALS, VOLATILE, SEMI-VOLATILE AND RADIONUCLIDE ANALYSIS
HPGe
VERTICAL SOIL PROFILE (ACTUAL LOCATION WILL BE SELECTED IN THE FIELD)
SCALE IN FEET
0 50 100
CONTROLLED AREA
OU8
RFP BOUNDARY
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden Colorado
INTEGRATED FIELD SAMPLING PLAN
FIGURE 2-11
PROPOSED SAMPLING LOCATIONS: IHSS Nos.: 118.1, 137, 139.1(S), 139.2, 144(N), & 150.3

65/170

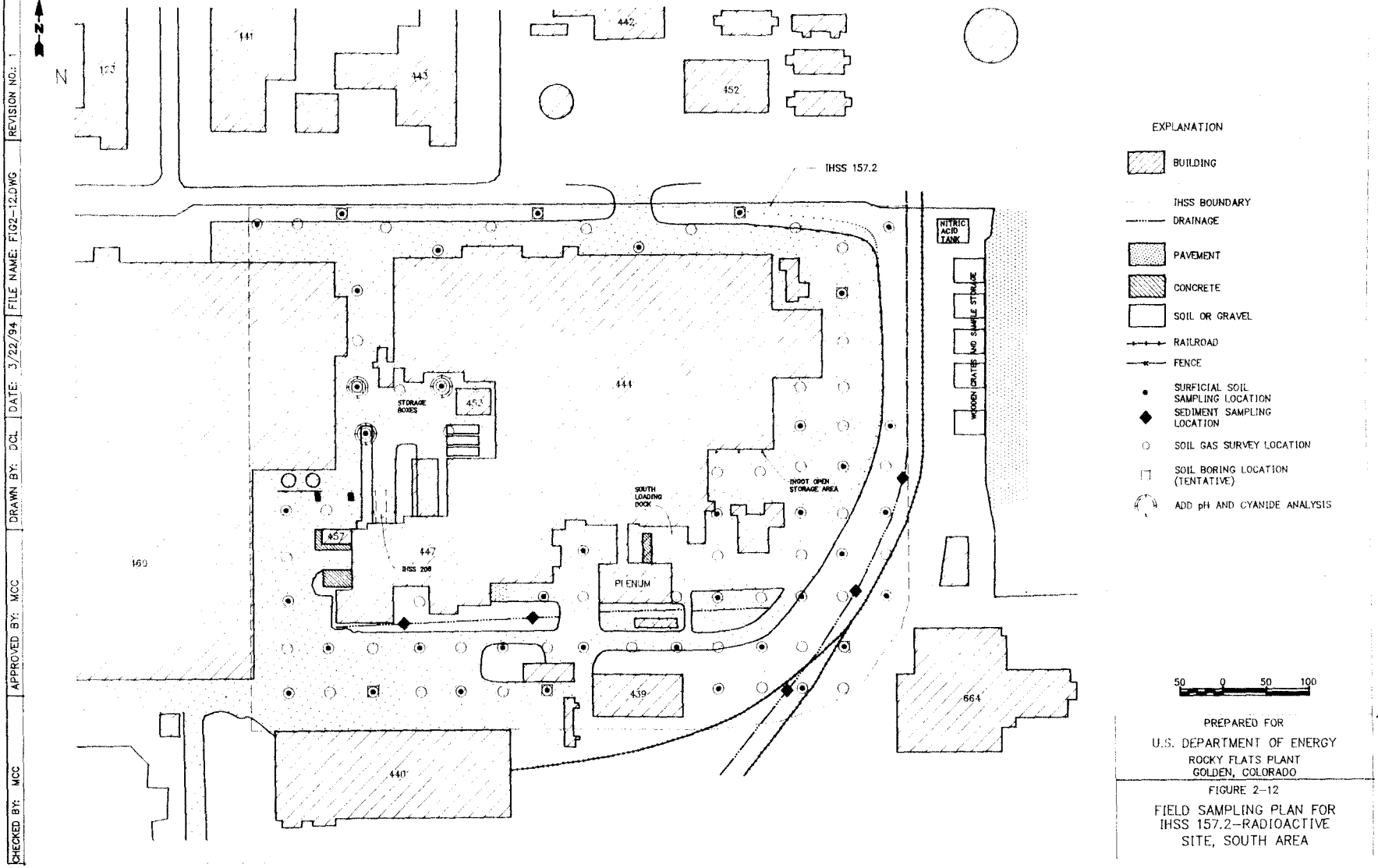

N
441
442
443
452
IHSS 157.2
NITRIC ACID TANK
WOODEN CRATES AND SAMPLE STORAGE
444
453
STORAGE BOXES
SOUTH LOADING DOCK
INGOT OPEN STORAGE AREA
457
447
IHSS 208
PLENUM
439
664
440
EXPLANATION
BUILDING
IHSS BOUNDARY
DRAINAGE
PAVEMENT
CONCRETE
SOIL OR GRAVEL
RAILROAD
FENCE
SURFICIAL SOIL SAMPLING LOCATION
SEDIMENT SAMPLING LOCATION
SOIL GAS SURVEY LOCATION
SOIL BORING LOCATION (TENTATIVE)
ADD pH AND CYANIDE ANALYSIS
50 0 50 100
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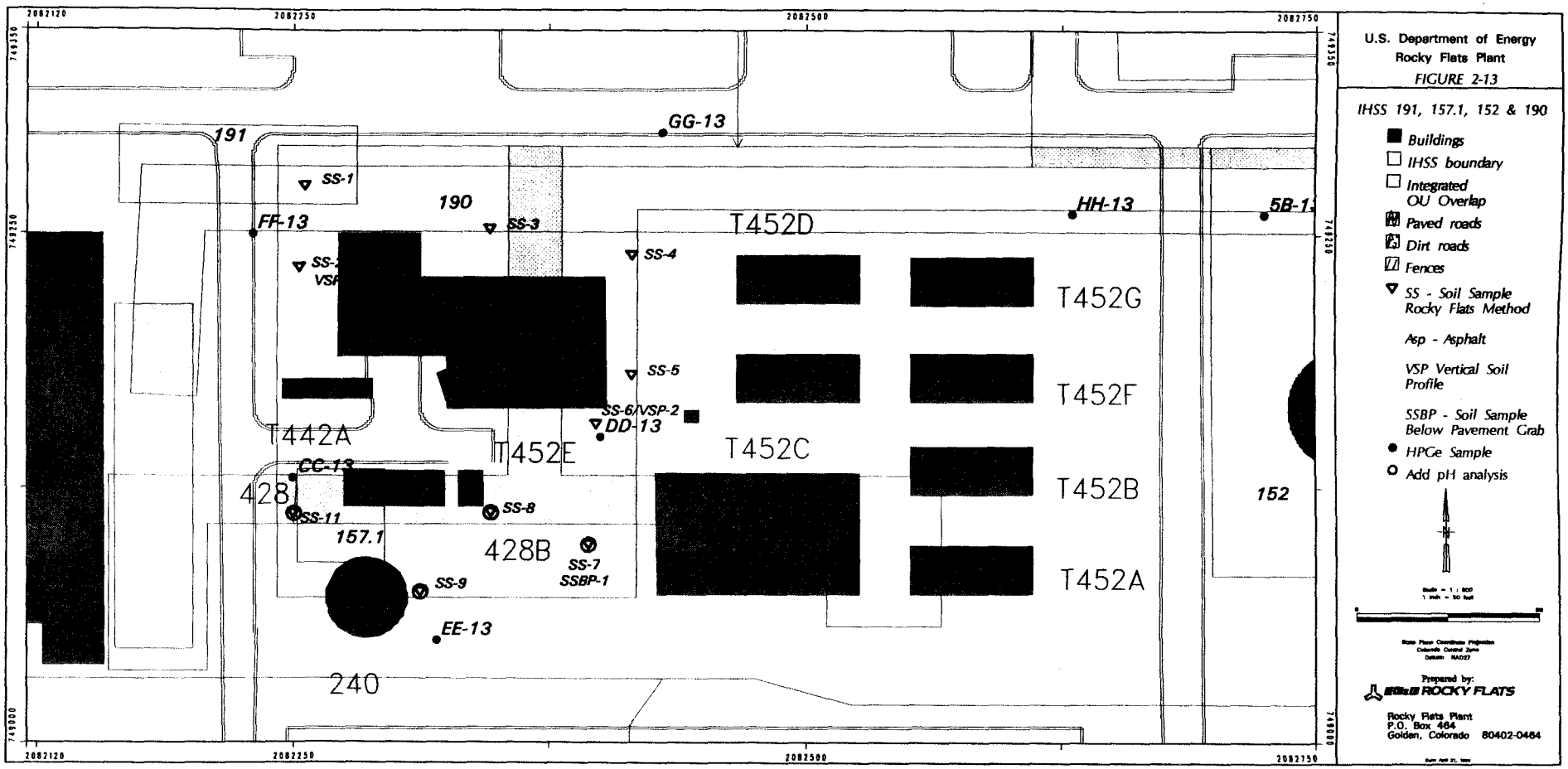
FIGURE 2-12
FIELD SAMPLING PLAN FOR IHSS 157.2-RADIOACTIVE SITE, SOUTH AREA
CHECKED BY: MCC
APPROVED BY: MCC
DRAWN BY: DCL
DATE: 3/22/94
FILE NAME: FIG2-12.DWG
REVISION NO.: 1

67/170


2082120
2082250
2082500
2082750
749350
749250
749000
191
GG-13
SS-1
190
SS-3
FF-13
HH-13
5B-1
T452D
SS-4
T452G
SS-5
T452F
SS-6/VSP-2
DD-13
T442A
T452E
T452C
CC-13
428
SS-8
T452B
152
SS-11
157.1
428B
SS-7
SSBP-1
SS-9
T452A
EE-13
240
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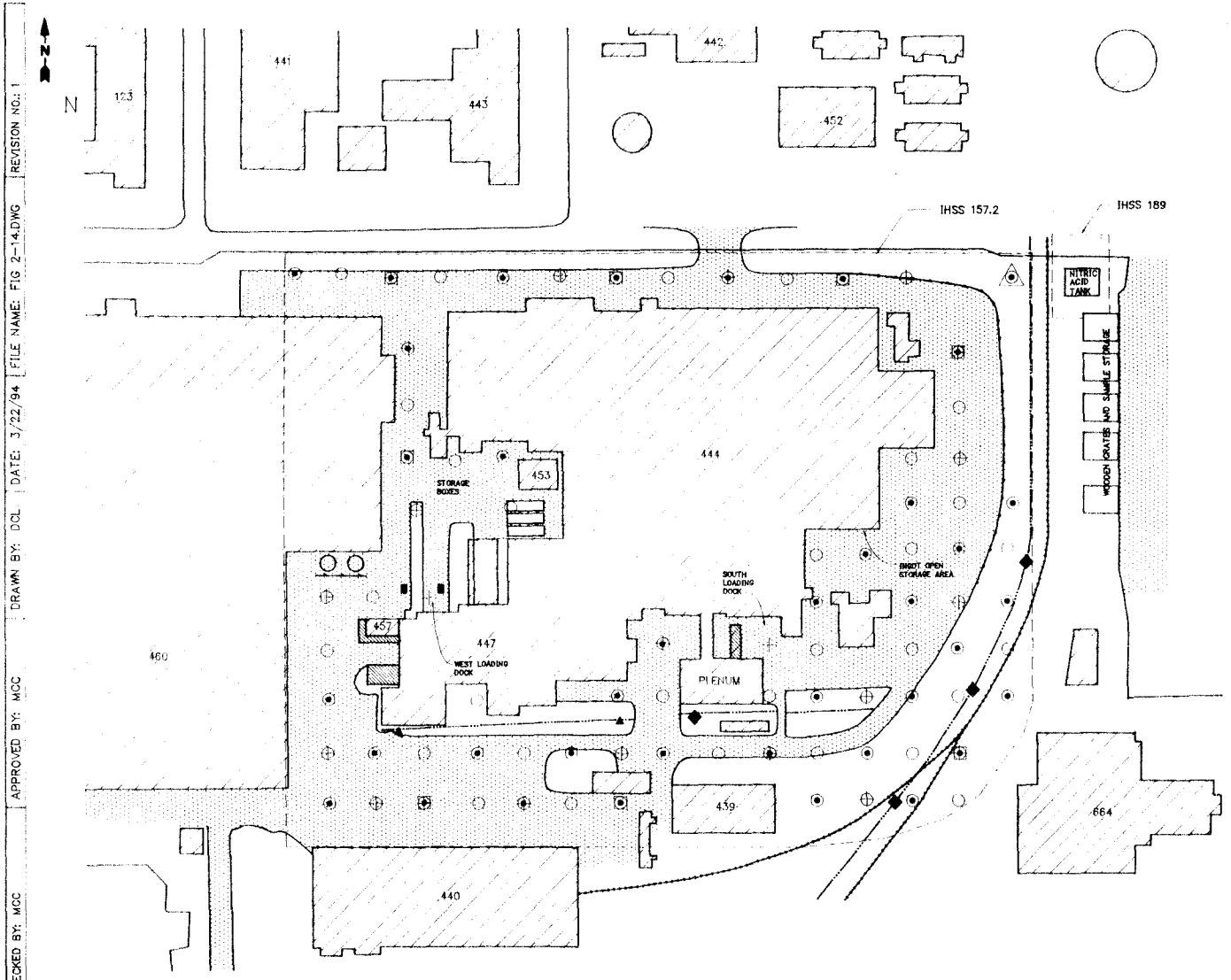
Rocky Flats Plant
FIGURE 2-13
IHSS 191, 157.1, 152 & 190
Buildings
IHSS boundary
Integrated OU Overlap
Paved roads
Dirt roads
Fences
SS - Soil Sample Rocky Flats Method
Asp - Asphalt
VSP Vertical Soil Profile
SSBP - Soil Sample Below Pavement Grab
HPGe Sample
Add pH analysis
Prepared by:
ROCKY FLATS
Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80402-0464

69/170



EXPLANATION

- BUILDING
- IHSS BOUNDARY
- DRAINAGE
- PAVEMENT
- CONCRETE
- SOIL OR GRAVEL
- RAILROAD
- FENCE
- SURFICIAL SOIL SAMPLING LOCATION
- SEDIMENT SAMPLING LOCATION
- SOIL GAS SURVEY LOCATION
- SOIL BORING LOCATION (TENTATIVE)
- ADD pH ANALYSIS TO SURFACE SOIL SAMPLE

50 0 50 100

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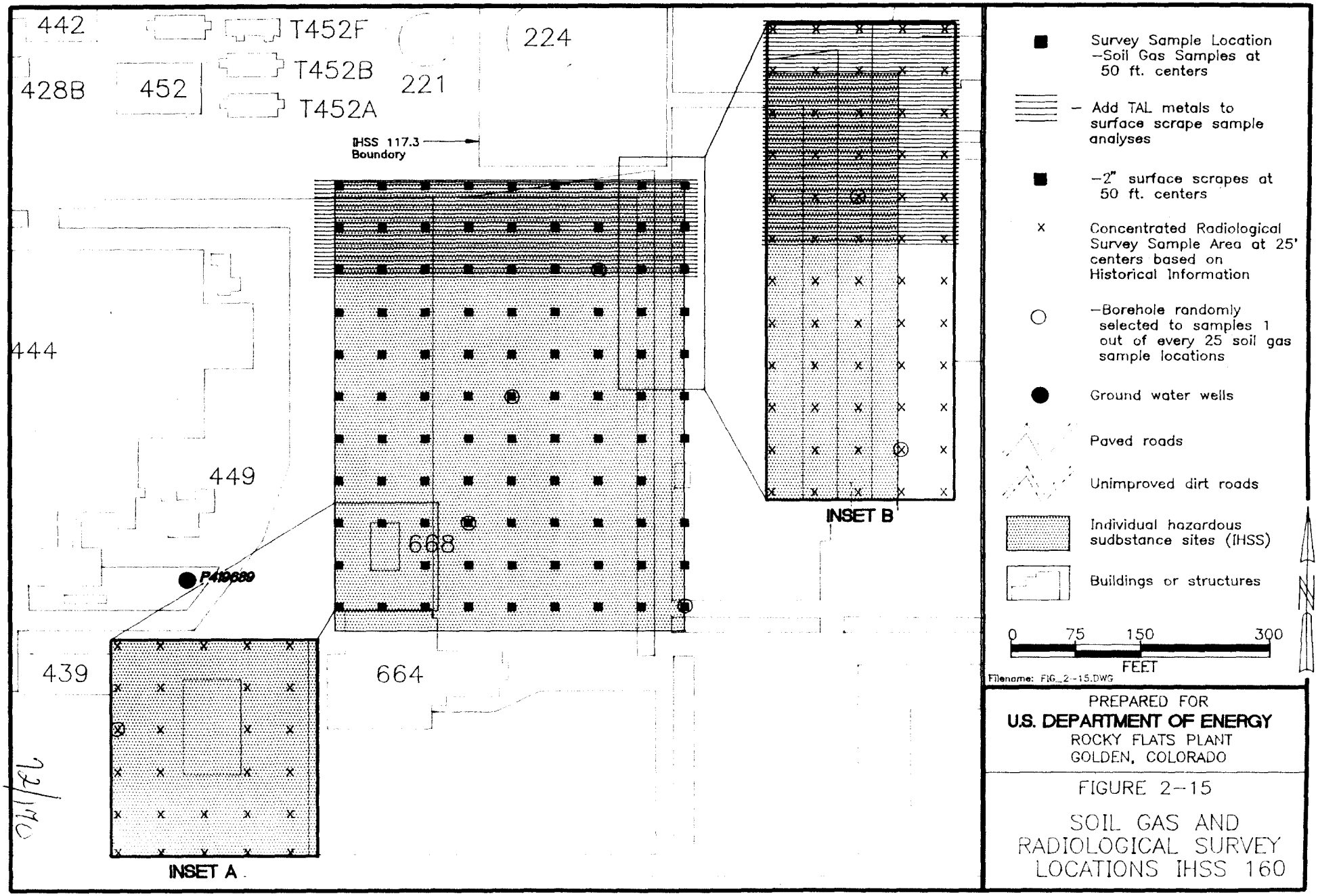
FIGURE 2-14

FIELD SAMPLING PLAN FOR IHSS 157.2-RADIOACTIVE SITE, SOUTH AREA

CHECKED BY: MCC | APPROVED BY: MCC | DRAWN BY: DCL | DATE: 3/22/94 | FILE NAME: FIG 2-14.DWG | REVISION NO.: 1

19170



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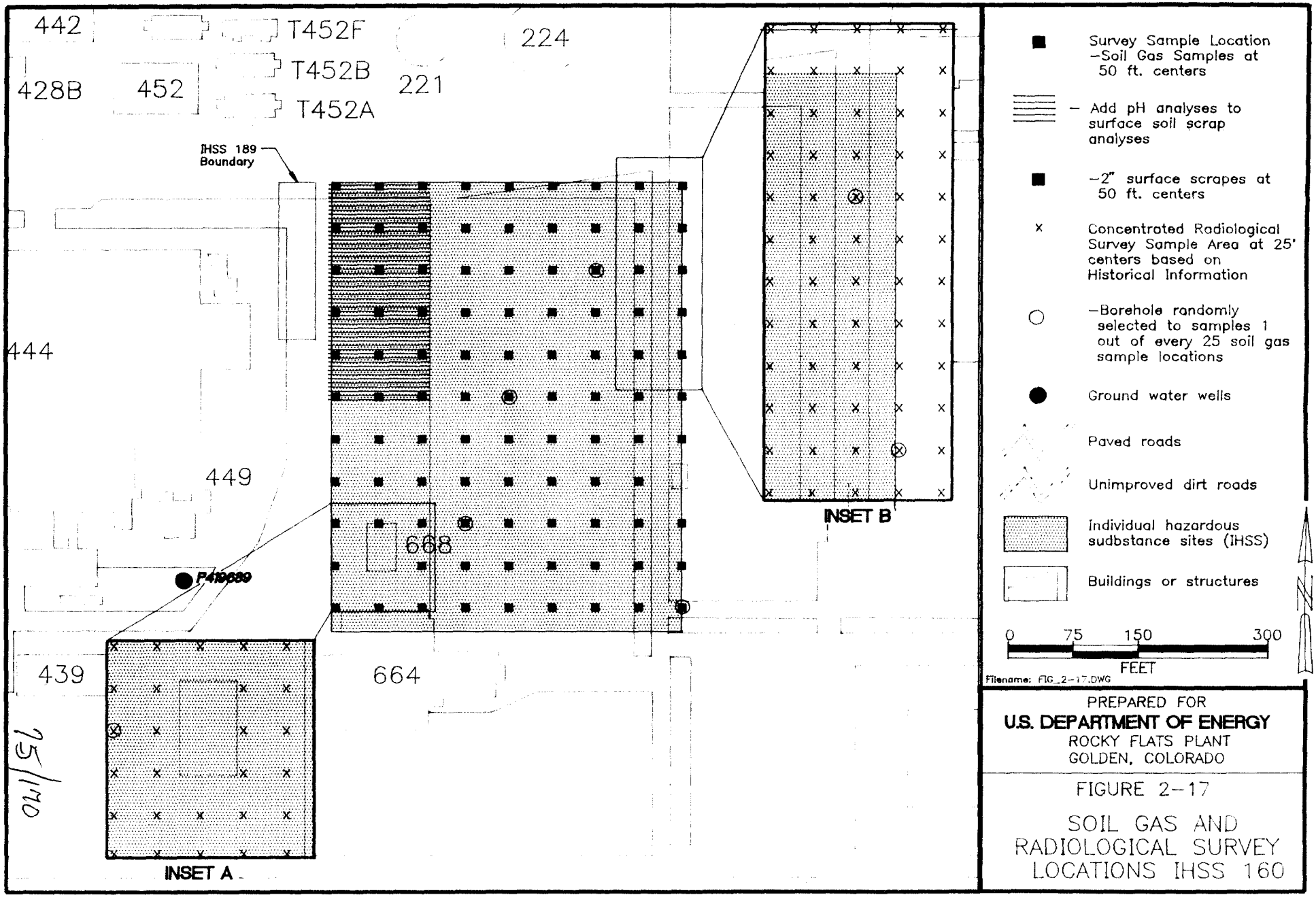
ROCKY FLATS PLANT
GOLDEN, COLORADO

FIGURE 2-15

SOIL GAS AND RADIOLOGICAL SURVEY LOCATIONS IHSS 160


2082650
2082850
2083200
2083500
749500
749350
749200
749050
748900
748750
R-13
O-13
5A-13
117.2
558
555
SS-10
SSBP-1
SS-11
SSBP-2
13
5B-13
N-13
M-13
II-13
KK-13
JJ-13
SS-7
VSP-2
117.3
SS-6
SS-8
SS-9
2G
2F
2B
2A
675
SS-4
SS-3
SS-5
152
K-13
L-13
SS-2
VSP-1
SS-1
T690G
T690C
T6901
663
U.S. Department of Energy
Rocky Flats Plant
FIGURE 2-16
IHSS 152 & 1173
Buildings
IHSS boundary
Integrated OU Overlap
Paved roads
Dirt roads
Fences
SS - Soil Sample Rocky Flats Method
Asp - Asphalt
VSP Vertical Soil Profile
SSBP - Soil Sample Below Pavement Grab
HPGe Sample
Add total Uranium, total plutonium, gross alpha and gross beta analyses
N
Prepared by:
ROCKY FLATS
Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80402-0464

73/170


442
T452F
224
T452B
428B
452
221
T452A
IHSS 189
Boundary
444
449
668
INSET B
P419689
439
664
INSET A
Survey Sample Location
–Soil Gas Samples at
50 ft. centers
– Add pH analyses to
surface soil scrap
analyses
–2" surface scrapes at
50 ft. centers
Concentrated Radiological
Survey Sample Area at 25'
centers based on
Historical Information
–Borehole randomly
selected to samples 1
out of every 25 soil gas
sample locations
Ground water wells
Paved roads
Unimproved dirt roads
Individual hazardous
sudbstance sites (IHSS)
Buildings or structures
0
75
150
300
FEET
N
Filename: FIG_2-17.DWG
PREPARED FOR
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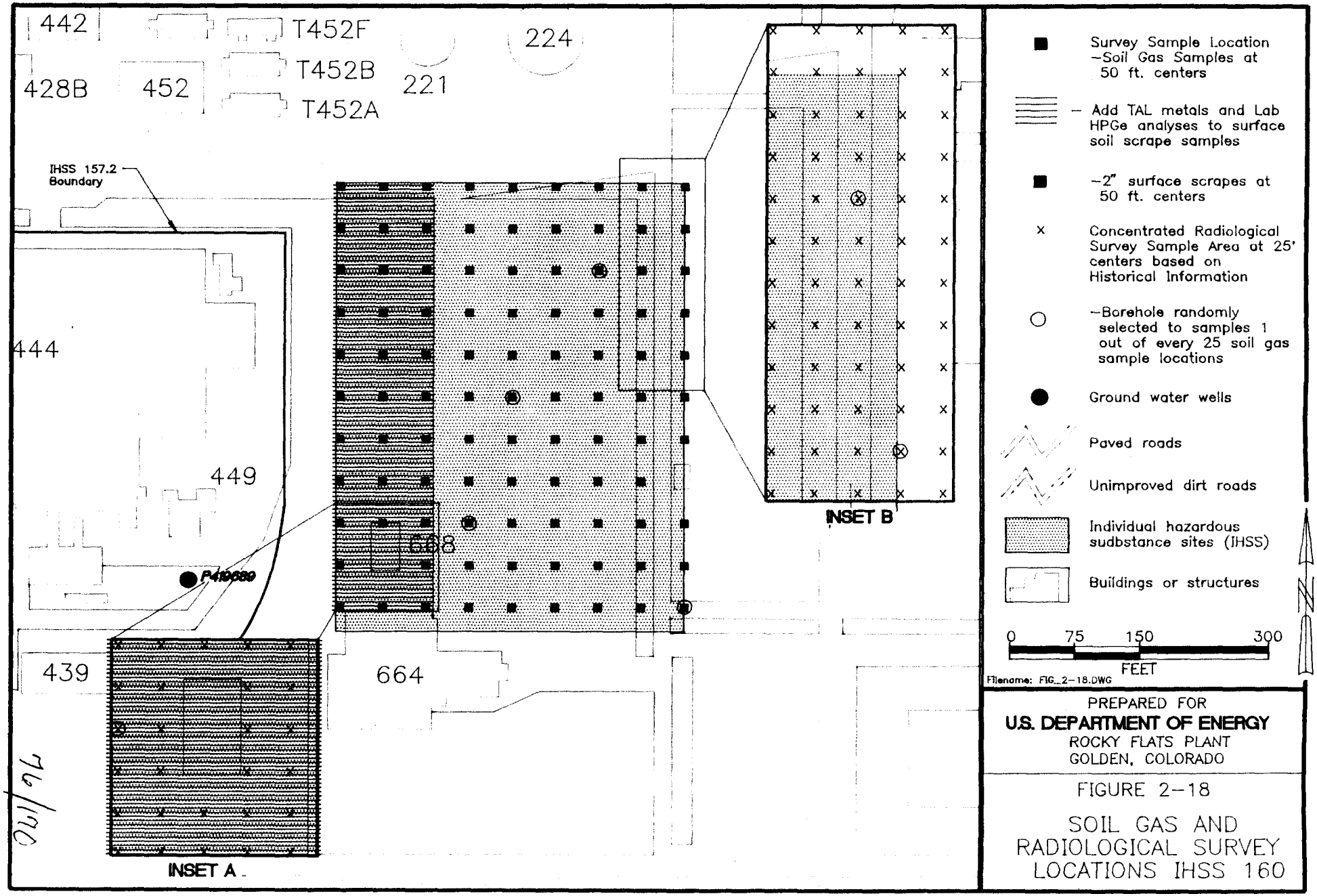
ROCKY FLATS PLANT
GOLDEN, COLORADO
FIGURE 2-17
SOIL GAS AND
RADIOLOGICAL SURVEY
LOCATIONS IHSS 160


442
T452F
224
428B
452
T452B
221
T452A
IHSS 157.2
Boundary
444
449
668
P419689
439
664
INSET A
INSET B
Survey Sample Location –Soil Gas Samples at 50 ft. centers
– Add TAL metals and Lab HPGe analyses to surface soil scrape samples
–2" surface scrapes at 50 ft. centers
Concentrated Radiological Survey Sample Area at 25' centers based on Historical Information
–Borehole randomly selected to samples 1 out of every 25 soil gas sample locations
Ground water wells
Paved roads
Unimproved dirt roads
Individual hazardous sudbstance sites (IHSS)
Buildings or structures
0 75 150 300
FEET
Filename: FIG_2-18.DWG
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ROCKY FLATS PLANT
GOLDEN, COLORADO
FIGURE 2-18
SOIL GAS AND RADIOLOGICAL SURVEY LOCATIONS IHSS 160

Approved By:

Director	/ / (Date)
Project Manager	/ / (Date)
Quality Assurance Program Manager	/ / (Date)

Integrated Field Sampling Plan,
Industrial Area Operable Units

3.0 SAMPLING PROGRAM AND LOCATIONS

This section provides a brief summary of the integrated nonintrusive data collection activities for the Phase I RFI/RI investigation activities at the Integrated OUs. Detailed sampling programs for each IHSS are presented in the FSP portion of the approved work plan for each OU. A comprehensive summary of the types and numbers of samples to be collected at each IHSS within the Integrated OUs is provided in Tables 3-1 through 3-7. The nonintrusive sampling activities proposed for OU9, however, are limited to storage tanks located outside the industrial area buildings.

3.1 VISUAL INSPECTIONS AND SITE WALKS

Visual inspections and site walks (VI/SW) will be performed at each of the IHSSs before field activities begin. Results of the VI/SWs will identify the following:

- sampling locations (all OUs);
- OPWL component locations and interconnections (OU9 only);

TABLE 3-1
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 8 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
118.1	Soil-Gas Survey	7
118.2	Soil-Gas Survey	7
123.1	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Vertical Profile	9 9 14 4
135	Surface-Soil Sampling (Chem)	5
137	Surface-Soil Sampling (Chem)	7
138	Surface-Soil Sampling (Chem) Radiological Survey Vertical Profile	7 3 1
139.1 (N)	Surface-Soil Sampling (Chem)	8
139.1 (S)	Surface-Soil Sampling (Chem)	3
139.2	Surface-Soil Sampling (Chem)	3
144 (N)	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Sediment Sampling Vertical Profile	5 5 1 + 1
144 (S)	Surface-Soil Sampling (Chem) Soil-Gas Survey	7 7
150.1	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Vertical Profile	10 10 12 4
150.2	Radiological Survey Vertical Profile	10 4
150.3	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Vertical Profile	7 7 7 3
150.4	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Vertical Profile	5 5 1 2
150.6/ 150.8	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Vertical Profile Asphalt or Concrete Sampling	10 10 9 4 3
150.7	Radiological Survey Vertical Profile	26 5

TABLE 3-1 (continued)
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 8 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
151	Surface-Soil Sampling (Chem)	5
	Soil-Gas Survey	5
163.1	Surface-Soil Sampling (Chem)	9
	Soil-Gas Survey	9
	Radiological Survey	7
	Vertical Profile	3
163.2	Geophysical Survey	1
172	Radiological Survey	+
	Vertical Profile	+
	Asphalt or Concrete Sampling	2
173	Surface-Soil Sampling (Chem)	3
	Soil-Gas Survey	3
	Radiological Survey	1
	Vertical Profile	2
184	Radiological Survey	4
	Vertical Profile	1
188	Surface-Soil Sampling (Chem)	5
	TOTALS	
	Surface-Soil Sampling (Chem)	113
	Soil-Gas Survey	84
	Radiological Survey	96
	Vertical Soil Profile	35
	Geophysical Survey	1
	Asphalt or Concrete Sampling	5
	QUALITY ASSURANCE QUALITY CONTROL	**TOTAL**
	DUPLICATES AT 10 PERCENT	
	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	8
	FIELD BLANKS AT 5 PERCENT	
	Not Applicable	
	EQUIPMENT RINSATES AT 5 PERCENT	
	Surface Soil Sampling (Chem)	6
	Soil-Gas Survey	4
	TRIP BLANKS AT 5 PERCENT	
	Soil-Gas Survey	4

NOTES:
(N) = NORTH (chem) = chemical analyses
(S) = SOUTH + = to be determined

Note: All numbers are estimates. Final numbers may change based on field reconnaissance. See Table 4-1 for specific analyses for each sample activity.

TABLE 3-2
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 9 SAMPLING PROGRAM
OUTSIDE TANKS
ROCKY FLATS PLANT

TANK NO.	SAMPLE TYPE	NO. OF SAMPLES
T-1	Radiological Survey	9
T-2 and T-3	Radiological Survey Surface Soil Sampling (Chem) Residue or Wipe Vault Water Sampling	9 11 4 +
T-7	Radiological Survey	8
T-8 and T-9	NA	NA
T-10	Radiological Survey Residue or Wipe	12 2
T-11 and T-30	NA	NA
T-14, T-15, T-16, and T-17	Radiological Survey Residue or Wipe	12 3
T-21 and T-22	Radiological Survey Residue or Wipe Vault Water Sampling	9 3 +
T-24	NA	NA
T-27	Surface Soil Sampling (Chem) Radiological Survey	3 •
T-29	Radiological Survey Residue or Wipe Surface Soil Sampling (Chem) Vault Water Sampling	10 2 2 +
T-32	NA	NA
TOTALS Surface Soil Sampling (Chem) Radiological Survey Residue or Wipe Vault Water Sampling		 16 69 14 +
QUALITY ASSURANCE QUALITY CONTROL **DUPLICATES AT 10 PERCENT** Surface Soil Sampling (Chem) **FIELD BLANKS AT 5 PERCENT** Not Applicable **EQUIPMENT RINSATES AT 5 PERCENT** Surface Soil Sampling (Chem)		**TOTAL** 2 1

NOTES:
(N) = NORTH (chem) = chemical analyses + = to be determined.
(S) = SOUTH NA = No Sampling Planned • = included in T-21 and T-22.

Note: All numbers are estimates. Final numbers may change based on field reconnaissance. See Table 4-2 for specific analyses for each sample activity.

TABLE 3-3
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 10 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
129	Surface-Soil Sampling (Chem) Soil-Gas Survey Tank Residue Sampling	11 25 1
170	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey	35 224 27
174 A,B	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey	33 21 24
175	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey	10 10 7
176	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey	29 224 22
177	Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey	10 16 18
181	Soil-Gas Survey Radiological Survey	3 7
182	Soil-Gas Survey Radiological Survey	14 9
205	Tank Residue Sampling	2
206	Surface Soil Sampling (Chem)	10
207	Radiological Survey	5
208	Surface-Soil Sampling (Chem)	3
210	Surface-Soil Sampling (Chem) Soil-Gas Survey	10 10
213	Surface-Soil Sampling (Chem) Radiological Survey	25 24
214	Surface-Soil Sampling (Chem) Radiological Survey	19 18
	TOTALS Surface-Soil Sampling (Chem) Soil-Gas Survey Radiological Survey Tank Residue Sampling	 195 547 161 3

TABLE 3-3 (continued)
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 10 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
	QUALITY ASSURANCE QUALITY CONTROL	**TOTAL**
	DUPLICATES AT 10 PERCENT	
	Surface Soil Sampling	20
	Soil-Gas Survey	55
	FIELD BLANKS AT 5 PERCENT	
	Not Applicable	
	EQUIPMENT RINSATES AT 5 PERCENT	
	Surface Soil Sampling	10
	Soil-Gas Survey	27
	TRIP BLANKS AT 5 PERCENT	
	Soil-Gas Survey	27

NOTES:
(N) = NORTH (chem) = chemical analyses
(S) = SOUTH

Note: All numbers are estimates. Final numbers may change base on field reconnaissance. See Table 4-3 for specific analyses for each sample activity.

TABLE 3-4
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 12 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
116.1	Surface-Soil Sampling (Chem)	8
	Soil-Gas Survey	8
	Surface-Soil Sampling (Rad)	2
	Radiological Survey	18
	Asphalt or Concrete Sampling	3
	Sediment Sampling	3
	Vertical Soil Profile	2
116.2	Surface-Soil Sampling (Chem)	4
	Soil-Gas Survey	4
	Surface-Soil Sampling (Rad)	2
	Radiological Survey	8
	Asphalt or Concrete Sampling	3
	Sediment Sampling	3
120.1	Surface-Soil Sampling (Chem)	9
	Soil-Gas Survey	9
	Radiological Survey	9
	Vertical Soil Profile	3
120.2	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	11
	Surface-Soil Sampling (Rad)	4
	Radiological Survey	5
	Asphalt or Concrete Sampling	3
	Vertical Soil Profile	1
136.1	Surface-Soil Sampling (Chem)	4
	Surface-Soil Sampling (Rad)	2
	Radiological Survey	18
	Sediment Sampling	1
136.2	Surface-Soil Sampling (Chem)	11
	Surface-Soil Sampling (Rad)	3
	Radiological Survey	30
	Sediment Sampling	4
	Vertical Soil Profile	3
147.2	Surface-Soil Sampling (Chem)	9
	Radiological Survey	9
	Vertical Soil Profile	3
157.2	Surface-Soil Sampling (Chem)	46
	Soil-Gas Survey	81
	Surface-Soil Sampling (Rad)	8
	Radiological Survey	22
	Sediment Sampling	5
	Asphalt or Concrete Sampling	12
	Vertical Soil Profile	12
187	Surface-Soil Sampling (Chem)	5

TABLE 3-4 (continued)
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 12 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
189	Surface-Soil Sampling (Chem)	5
	TOTALS	
	Surface-Soil Sampling (Chem)	112
	Soil-Gas Survey	113
	Surface-Soil Sampling (Rad)	21
	Radiological Survey	119
	Asphalt or Concrete Sampling	21
	Sediment Sampling	16
	Vertical Soil Profile	24
	QUALITY ASSURANCE QUALITY CONTROL	**TOTAL**
	DUPLICATES AT 10 PERCENT	
	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	11
	Surface-Soil Sampling (Rad)	2
	Radiological Survey	12
	Asphalt or Concrete Sampling	2
	Sediment Sampling	2
	Vertical Soil Profile	2
	FIELD BLANKS AT 5 PERCENT	
	Not Applicable	
	EQUIPMENT RINSATES AT 5 PERCENT	
	Surface-Soil Sampling (Chem)	5
	Soil-Gas Survey	5
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	5
	Asphalt or Concrete Sampling	1
	Sediment Sampling	1
	Vertical Soil Profile	1
	TRIP BLANKS AT 5 PERCENT	
	Soil-Gas Survey	5

NOTES:
(N) = NORTH (chem) = chemical analyses
(S) = SOUTH (Rad) = radionuclide analyses

Note: All numbers are estimates. Final numbers may change base on field reconnaissance. See Table 4-4 for specific analyses for each sample activity.

TABLE 3-5
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 13 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
117.1/197	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	98
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	98
	Vertical Profile	+
117.2	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	144
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	143
	Asphalt or Concrete Sampling	5
	Vertical Profile	+
117.3	Surface-Soil Sampling (Chem)	5
	Soil-Gas Survey	40
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	94
128/ 134(N)	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	15
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	14
134(S)	Surface-Soil Sampling (Chem)	3
	Soil-Gas Survey	27
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	40
	Asphalt as Concrete Sampling	4
	Vertical Profile	+
148	Soil-Gas Survey	102
	Radiological Survey	102
	Vertical Profile	+
152	Soil-Gas Survey	13
157.1	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	63
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	63
	Vertical Profile	+
158	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	83
	Surface-Soil Sampling (Rad)	1
	Radiological Survey	83
	Vertical Profile	+
171	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	56
	Radiological Survey	56
	Vault Water Sampling	1
	Vertical Profile	+

TABLE 3-5 (continued)
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 13 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
186	Surface-Soil Sampling (Chem)	11
	Soil-Gas Survey	69
	Surface-Soil Sampling (Rad)	2
	Radiological Survey	69
	Vertical Profile	+
	TOTALS	
	Surface-Soil Sampling (Chem)	77
	Soil-Gas Survey	715
	Surface-Soil Sampling (Rad)	9
	Asphalt or Concrete Sampling	9
	Vertical Profile	+
	Radiological Survey	767
	Vault Water Sampling	1
	QUALITY ASSURANCE QUALITY CONTROL	**TOTAL**
	DUPLICATES AT 10 PERCENT	
	Surface-Soil Sampling (Chem)	8
	Soil-Gas Survey	71
	Surface-Soil Sampling (Rad)	1
	Asphalt or Concrete Sampling	1
	Vertical Profile	+
	FIELD BLANKS AT 5 PERCENT	
	Not Applicable	
	EQUIPMENT RINSATES AT 5 PERCENT	
	Surface-Soil Sampling (Chem)	3
	Soil-Gas Survey	35
	Surface-Soil Sampling (Rad)	1
	Asphalt or Concrete Sampling	1
	Vertical Soil Profile	+
	TRIP BLANKS AT 5 PERCENT	
	Soil-Gas Survey	35

NOTES:
(N) = NORTH
(S) = SOUTH
+ = To be determined
(chem) = chemical analyses
(Rad) = radionuclide analyses

Note: All numbers are estimates. Final numbers may change base on field reconnaissance. See Table 4-5 for specific analyses for each sample activity.

TABLE 3-6
SUMMARY OF NONINTRUSIVE SAMPLE TYPES AND AMOUNTS
OPERABLE UNIT 14 SAMPLING PROGRAM
ROCKY FLATS PLANT

IHSS	SAMPLE TYPE	NO. OF SAMPLES
131	Surface-Soil Sampling (Rad)	19
156.1	Surface-Soil Sampling (Rad) Radiological Survey	175 243
160	Surface-Soil Sampling (Rad) Soil Gas Survey Radiological Survey	98 98 90
161	Surface-Soil Sampling (Rad) Soil-Gas Survey Radiological Survey	28 28 28
162	Surface-Soil Sampling (Rad) Radiological Survey	24 81
164.1	Surface-Soil Sampling (Rad) Radiological Survey	15 15
164.2	Surface-Soil Sampling (Rad) Radiological Survey	59 70
164.3	Surface-Soil Sampling (Rad) Radiological Survey	46 46
	TOTALS Surface-Soil Sampling (Rad) Soil-Gas Survey Radiological Survey	 464 126 573
	QUALITY ASSURANCE QUALITY CONTROL	**TOTAL**
	DUPLICATES AT 10 PERCENT	
	Surface-Soil Sampling (Rad)	47
	Soil-Gas Survey	13
	FIELD BLANKS AT 5 PERCENT	
	Not Applicable	
	EQUIPMENT RINSATES AT 5 PERCENT	
	Surface-Soil Sampling	24
	Soil-Gas Survey	7
	TRIP BLANKS AT 5 PERCENT	
	Soil-Gas Survey	7

NOTES:
(N) = NORTH (Rad) = radionuclide analyses
(S) = SOUTH

Note: All numbers are estimates. Final numbers may change base on field reconnaissance. See Table 4-6 for specific analyses for each sample activity.

TABLE 3-7
NONINTRUSIVE SAMPLING SUMMARY
ALL INTEGRATED OPERABLE UNITS
ROCKY FLATS PLANT

SAMPLE TYPE	TOTAL NO. OF SAMPLES
Surface-Soil Sampling (Chem)	676
Soil-Gas Survey	1,622
Surface-Soil Sampling (Rad)	616
Radiological Survey	1,672
Asphalt or Concrete Sampling	35
Sediment Sampling	16
Vertical Profile	59
Geophysical Survey	1
Tank Residue or Wipe Sampling	17
Vault Water Sampling	1

QUALITY ASSURANCE QUALITY CONTROL	TOTALS
DUPLICATES AT 10 PERCENT	
Surface-Soil Sampling (Chem)	68
Soil-Gas Survey	162
Surface-Soil Sampling (Rad)	62
Asphalt or Concrete Sampling	3
Sediment Sampling	2
Vertical Profile	6
FIELD BLANKS AT 5 PERCENT	
Sediment Sampling	1
EQUIPMENT RINSATES AT 5 PERCENT	
Surface-Soil Sampling (Chem)	34
Soil-Gas Survey	81
Surface-Soil Sampling (Rad)	31
Asphalt or Concrete Sampling	1
Sediment Sampling	1
Vertical Profile	3
TRIP BLANKS AT 5 PERCENT	
Sediment Sampling	3
Soil-Gas Survey	81

NOTES:

(Chem) = chemical analysis
(Rad) = radiological survey

Note: All numbers are estimates. Final numbers may change base on field reconnaissance.

- underground storage tanks and ancillary equipment to be inspected as a later task (Section 3.8) (OU8 and OU10);

- locations of structural features such as overhead or underground piping and utilities, valves, cleanouts, manholes, etc. (all OUs);

- locations of pipeline connection to buildings (all applicable OUs);

- areas where construction activities may have disturbed OPWL components (OU9) or IHSS specific features (all OUs); and

- logistical problems associated with field sampling activities such as security requirements, heavy equipment access restrictions, etc. (all OUs).

3.2 DATA COMPILATION

Data compilation consists of assembling and reviewing all available information on OUs 8 and 9 to focus subsequent sampling activities. These tasks include records review, VI/SWs (Section 3.1), and interviews with people familiar with the operations that occurred within an OU.

3.2.1 Operable Unit 8

To adequately complete the data compilation task for OU8, plant as-built engineering drawings, available design and construction information, and previous studies will be reviewed to determine the following items:

- the existence of foundation drain systems around the perimeter of the footings of OU8 buildings; and

- segments of sanitary and storm sewer systems that are likely to have joints, cracks, or other types of breaks for an evaluation of exfiltration/infiltration of the piping systems.

It is suspected that potentially contaminated groundwater may be collected and transported in the building foundation drain systems or through breaks, joints, etc. in the ancillary piping or conduit. This review will help determine where groundwater may be entering these systems.

Following review of the drawings, a VI/SW will be conducted to evaluate the locations of the drains, piping, and ancillary equipment and to determine appropriate sampling locations. Results of this data compilation task will be summarized in a technical memorandum that will also contain proposed sampling locations for the Phase I nonintrusive sampling activities for OU8. Further details of the OU8 data compilation task are presented in Section 6.4.1 of the OU8 Work Plan (EG&G 1992a).

3.2.2 Operable Unit 9

The OU9 data compilation task will include review of facilities engineering drawings, photographic logbooks, the HRR, and any other pertinent information related to OU9. A VI/SW will provide a tactical assessment and identify OPWL component locations, structural features, areas where construction activities may have disturbed OPWL components, logistical problems associated with field sampling, and other physical information about the OPWL. Interviews with individuals involved with RFP waste treatment and disposal, and preparation of the RCRA Closure Plan (DOE 1988) for the OPWL may also provide important information. Specific

objectives and further details of the OU9 data compilation tasks are presented in Section 7.2.4 of the OU9 Work Plan (EG&G 1992b).

Upon completion of the data compilation activities, a series of technical memoranda that summarize the results of these activities as well as propose Phase I nonintrusive sampling activities and locations will be issued. These technical memoranda will be organized with summaries for the process waste lines, storage tanks located within the industrial area buildings, and storage tanks located outside the industrial area buildings. The OU9 Technical Memorandum has been completed at the time of this writing (Jacobs 1994a) and has been referenced in preparation of this report.

3.3 SURFACE RADIOLOGICAL SURVEYS

HPGe and NaI detectors will be used to assess the potential for radioactive contamination that remains in surface soils. These surveys will be conducted in accordance with the SOW at locations specified in the individual work plans for OUs 8, 10, 12, 13, and 14. OU9 surface radiation survey locations will be summarized in a future technical memorandum after all data compilation activities for OU9 have been completed.

The HPGe survey will be performed by EG&G technical personnel with assistance from Jacobs. Jacobs will consult the EG&G technical personnel to coordinate and direct subsequent NaI survey tasks. The NaI survey will consist of performing a grid survey with a NaI detector to delineate specific radioactivity anomalies detected by the HPGe survey. The number and locations of NaI surveys will be based on the HPGe results.

Tables 3-1 through 3-7 present the number of surface radiation samples to be collected from the individual IHSSs in each OU. Details of the surface radiation surveys to be performed at each OU are in the following work plan section(s) for each OU:

- OU8 - Sections 6.4.2.1 and 6.5;
- OU10 - Sections 7.3 and 7.4.2;
- OU12 - Sections 6.2.1 and 6.3;
- OU13 - Sections 6.3 and 6.4.1; and
- OU14 - Sections 6.3.1, 6.4 and 6.5.2.

3.4 SURFACE WATER AND SEDIMENT SAMPLING

Migration of contaminants through surface water runoff will be investigated with surface water and sediment samples. Storm and sanitary sewer systems and drainage pathways will be sampled as appropriate. The OU Work Plans currently indicate that surface water or sediment sampling, or both, will be performed at:

- OU8 where sanitary or storm sewer systems connect to building footing underdrains;

- OU12 - IHSS 116.1 - debris-filled drains and the storm drain west of the IHSS,
  - IHSS 116.2 - ditch south of the loading dock,
  - IHSS 136.1 - storm drain in the southwest portion of the IHSS,
  - IHSS 136.2 - ditch that extends through the IHSS; and

- OU13 - IHSS 171 - open sump located within the IHSS.

Tables 3-1 through 3-7 present the number of surface water and sediment samples to be collected from the individual IHSSs in each OU. Details of the surface water and sediment sampling are in the following work plan sections for each applicable OU:

- OU8 - Sections 6.4.1.3;
- OU12 - Sections 6.2.3, 6.3.1, 6.3.2, 6.3.3 and 6.3.4; and
- OU13 - Sections 6.3.1.11.

3.5 SURFACE GEOPHYSICAL SURVEYS

Surface geophysical surveys will be conducted before any soil gas, concrete, or asphalt sampling activity begins. These surveys will be implemented to locate underground utilities, thus preventing damage to utilities or injury to field personnel. Generally, these surveys will use pipe and cable locator or electromagnetic instruments. Geophysical surveys for locating utilities will be performed by EG&G personnel.

Additionally, the pipeline location and tracing tasks at OU9 and 10 will use pipe locator instruments to trace the pipelines. Ground penetrating radar (GPR) may also be used for tracing pipelines if soil conditions and other utilities do not hamper the performance. A GPR survey will also be conducted as part of Stage 2 investigations at IHSS 163.2 in OU8 to locate a buried concrete slab.

Details of the limited surface geophysical surveys are in the following work plan sections for each applicable OU:

- OU8 - Section 6.5.18;
- OU9 - Section 7.3.1.1;
- OU10 - Section 7.4.4.1; and
- OU14 - Section 6.3.1 and 6.5.1.

3.6 CONCRETE/ASPHALT SAMPLING

In paved areas where anomalous activities are identified by the HPGe and NaI surveys, concrete or asphalt samples will be collected to verify the field surveys. Concrete or asphalt sampling is proposed for OUs 8, 12, and 13. However, the final sampling locations will be determined after evaluation of the HPGe and NaI surveys.

Tables 3-1 through 3-7 present the number of concrete or asphalt samples to be collected from the individual IHSSs in each OU. Details of the proposed concrete or asphalt sampling are in the following work plan section(s) for each applicable OU:

- OU8 - Sections 6.4.2.1;
- OU12 - Sections 6.2.2 and 6.4.4; and
- OU13 - Sections 6.2.2 - Tables 6.2 and 6.3, 6.3.1.2, 6.3.1.5, and 6.3.1.6.

3.7 SOIL-GAS SAMPLING

Soil-gas samples will be collected at IHSSs with suspected VOC contamination within OUs 8, 10, 12, 13 and 14. Soil-gas samples will be analyzed using a field laboratory Gas Chromatography Mass Spectrometry. Results of these analyses will be mapped to identify VOC anomalies.

Tables 3-1 through 3-7 present the number of soil-gas samples to be collected from the individual IHSSs in each OU. Details of the proposed soil-gas sampling are in the following work plan sections for each applicable OU:

- OU8 - Sections 6.2, 6.4.2.2 and 6.5;
- OU10 - Sections 7.1, 7.2, 7.3 and 7.4.3;
- OU12 - Sections 6.2.4, 6.3 and 6.4.6;
- OU13 - Sections 6.2, 6.3 and 6.4.2; and
- OU14 - Sections 6.3.1, 6.4 and 6.5.4.

3.8 TANK AND PIPELINE INSPECTION

Tanks and other ancillary structures (valves, vaults, drain systems, aboveground and underground piping, etc.) will be inspected to determine the physical condition of these structures and the presence of residual product or waste materials. In addition to visual inspections, pressure testing and residue sampling may be conducted.

Tank and pipeline inspections will be conducted at OU8 (IHSS 151), OU9, and OU10 (IHSSs 129 and 205). Details of the tank and pipeline inspections are in the following work plan section(s) for each applicable OU

- OU8 - Sections 6.4.2.4 and 6.5.16; and

- OU10 - Sections 7.3.1, 7.3.9, 7.4.4 and 7.4.5.

- Tank and pipeline inspections proposed for OU9 will be outlined in future technical memoranda.

3.9 SURFACE-SOIL SAMPLING

Surface-soil samples will be collected both under paved areas and at unpaved locations. These samples will be analyzed for both chemical and radiological constituents. The majority of IHSSs within OUs 8, 10, 12, 13, and 14 will be sampled. The purpose of the surficial soil sampling is to determine the presence and nature of contamination and contaminant variability to design a statistically based sampling program for subsequent stages.

Tables 3-1 through 3-7 summarize the number of surface soil samples to be collected from the individual IHSSs in each OU. Details of the planned surface soil sampling are in the following work plan section(s) for each applicable OU:

- OU8 - Sections 6.4.2.3 and 6.5;
- OU10 -Section 7.2, 7.3 and 7.4.1;
- OU12 - Section 6.2.2, 6.3 and 6.4.2;
- OU13 - Section 6.2.2, 6.3.1 and 6.4.3; and
- OU14 - Section 6.3, 6.4 and 6.5.3. Surface soil samples to be collected around the outside tanks of OU9 are described in Technical Memorandum No. 1, OU9 (Jacobs 1994a).

3.10 VERTICAL SOIL PROFILE SAMPLING

Vertical soil profile (VSP) samples will be collected separately from, but as a subset of, the surface radiological surveys (Section 3.3) to determine the vertical distribution in soil of radionuclides contributing to the surface radiological survey anomalies. Following evaluation of the HPGe and NaI results, VSP sample locations will be selected. VSP sampling will be conducted in areas of exposed soil only because concrete or asphalt materials attenuate gamma rays and, therefore, do not allow correlation between surface radiological measurements and the vertical distributions in the soil.

Tables 3-1 through 3-7 summarize the number of proposed VSP samples to be collected from the individual IHSSs in each OU. Details of the VSP sampling are in the following sections of the Work Plan for each applicable OU:

- OU8 - Section 6.2.1, 6.4.2.1 and 6.5;
- OU10 - Section 7.2, 7.3 and 7.4.2;
- OU12 - Section 6.2.1, 6.2.2, 6.3 and 6.4.3;
- OU13 - Section 6.3.1 and 6.4.1; and
- OU14 - Section 6.3.1.

3.11 SAMPLING ACTIVITY INTEGRATION WITH RFP STANDARD OPERATING PROCEDURES

EG&G has established Standard Operating Procedures (SOPs) for the performance of a wide variety of RFI/RI related tasks at RFP (EG&G 1992g). To ensure quality and uniformity in the execution of the approved Integrated OU Work Plans, specific SOPs are to be used for each

TABLE 3-8
ENVIRONMENTAL MANAGEMENT DEPARTMENT (EMD)
STANDARD OPERATING PROCEDURES (SOP) AND FIELD ACTIVITIES
FOR WHICH THEY ARE APPLICABLE
ROCKY FLATS PLANT

EMD SOP Reference Numbers	STANDARD OPERATING PROCEDURES	HPGe Surveys	Sediment Sampling	Surface Water Sampling	Field Radiation Surveys	Soil-Gas Surveys	Surface Soil Sampling	Asphalt/Concrete Sampling	Vertical Soil Profile Sampling
FO.01	Air Monitoring and Dust Control						●	●	●
FO.02	Field Document Control	●	●	●	●	●	●	●	●
FO.03	General Equipment Decontamination	●	●	●	●	●	●	●	●
FO.04	Heavy Equipment Decontamination						●		●
FO.06	Handling of Personal Protective Equipment	X	●	●	●	●	●	●	●
FO.07	Handling of Decontamination Water and Wash Water	●	●	●	●	●	●	●	●
FO.08	Handling of Drilling Fluids and Cuttings							●	
FO.09	Handling of Residual Samples						●		●
FO.11	Field Communications	●	●	●	●	●	●	●	●
FO.12	Decontamination Facility Operations				●	●	●	●	●
FO.13	Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples		●	●		●	●	●	●
FO.14	Field Data Management	●	●	●	●	●	●	●	●
FO.15	Use of PIDs and FIDs	X	X	X	X	X	X	X	X
FO.16	Field Radiological Measurements - Walk-Over Surveys	X			●	X	X	X	X
FO.18	*Environmental Sample Radioactivity Content Screening*		●	●	●	●	●	●	●
GT.01	Logging Alluvial and Bedrock Material						●		●
GT.08	Surface Soil Sampling					●		●	●
GT.09	Soil-Gas Sampling and Field Analysis					●			
GT.10	Borehole Clearing				●		X		●
GT.17	*Land Surveying*						●		●
GT.18	Surface Geophysical Surveys		●	●					

TABLE 3-8 (continued)
ENVIRONMENTAL MANAGEMENT DEPARTMENT (EMD)
STANDARD OPERATING PROCEDURES (SOP) AND FIELD ACTIVITIES
FOR WHICH THEY ARE APPLICABLE
ROCKY FLATS PLANT

EMD SOP Reference Numbers	STANDARD OPERATING PROCEDURES	HPGe Surveys	Sediment Sampling	Surface Water Sampling	Field Radiation Surveys	Soil-Gas Surveys	Surface Soil Sampling	Asphalt/Concrete Sampling	Vertical Soil Profile Sampling
GT.19	Field Gas Chromatographs					•			
GT.30	In Situ Characterization of Radionuclides	•							•
SW.02	Field Measurements for Surface Water Field Parameters			•					
SW.03	Surface Water Sampling			•				•	
SW.06	Sediment Sampling		•						
1.1	Gamma Radiation Surveys	•			•				•
1.2	Beta Radiation Surveys	•			•				•
3.2	Survey Requirements for Conditional and Unrestricted Use	•			•				•
TBD	Tank and Pipeline Investigation[1]								

EMD - Environmental Management Division
FID - Flame Ionization Detector
HPGe - High Purity Germanium
PID - Photoionization Detector
SOP - Standard Operating Procedure
TBD - To be determined. Procedures have been drafted and are currently under review, awaiting approval.
X - As required by Health & Safety Plan.
[1] - Includes procedures for video surveys, locator and tracing pipeline, and pressure tests.

sampling task. Table 3-8 provides the SOP references to be used during the nonintrusive activities proposed for the Integrated OUs.

In addition to EG&G's SOPs, Jacobs has recently completed draft SOPs for Tank and Pipeline Investigation, Surface Soil Sampling, and Concrete and Asphalt Sampling. These new SOPs are currently under review and are expected to be finalized before the field activities begin.

In the event that unique conditions are encountered requiring a modification to an SOP such changes will be requested by a Document Modification Request and, when possible, will be included in an appropriate technical memorandum. All nonintrusive sampling activities that generate appreciable quantities of particulate will be conducted in accordance with the Rocky Flats Plan for Prevention of Contaminant Dispersion (DOE 1992b).

Approved By:

Director	/ / (Date)
Project Manager	/ / (Date)
Quality Assurance Program Manager	/ / (Date)

4.0 SAMPLE ANALYSIS

The purpose of this section of the report is to summarize the sample handling, labeling and documentation techniques, analytical requirements, and sample container and preservation techniques to be used during the Phase I nonintrusive sampling activities proposed for the Integrated OUs. The RFI/RI Work Plans for the respective Integrated OUs were reviewed for consistency in these areas. The results of this evaluation are also reported in the following subsections.

4.1 SAMPLE DESIGNATION

The RFEDS requires that all sample designations be consistent. Each nonintrusive sample collected during the RFI/RI at the Integrated OUs will be designated with a nine-character sample number consisting of a two-letter prefix that relates to the type of sample media collected (e.g., SS for surface soil, SG for soil gas) followed by a unique five-digit number and a two-letter suffix identifying the contractor. The EG&G Project Manager will request a project identification (ID) prefix and block of sample numbers. One sample number will be required for each sample generated, including quality control samples. Using this system, 99,999 sample numbers are available for each sample medium for each contractor. The following type of

information will be contained in the sample numbers:

Character(s)	Description	Code
1 and 2	Sample Media	SG (Soil Gas)
3 through 7	Sample Number	00001 to 99999
8 and 9	Subcontractor ID	JE (Jacobs Engineering)

Sample numbers are assigned on a daily basis by the sample manager. Numbers are assigned consecutively, beginning with 00001. This sample designation scheme was consistent for all of the respective RFI/RI Work Plans.

4.2 ANALYTICAL REQUIREMENTS

After review of the RFI/RI Work Plans, the associated level of analytical requirements for each sample activity are the same for each OU and associated IHSSs. The proposed analytical program for the Integrated OUs and their associated IHSSs is presented in Tables 4-1 through 4-6. It should be noted that the required analyses listed on Tables 4-1 through 4-6 represent a summary of the analytical requirements as proposed in the respective RFI/RI Work Plans and Technical Memoranda prepared to date. Additional analytical recommendations provided in Table 2-8 are not included in Tables 4-1 through 4-6.

A list of analytes is necessary for the Integrated OUs because operational and release histories are not clearly defined for many IHSSs. Associated detection levels and quantitation limits for the respective analytes are presented in Table 4-7. The specific analytical methods are presented

TABLE 4-1
SUMMARY OF THE ANALYTICAL PROGRAM FOR NONINTRUSIVE SAMPLE ACTIVITIES
OPERABLE UNIT 8
ROCKY FLATS PLANT

	Radiological Survey			Specific Tasks					Specific Task Analyses				Surface Soil Analyses						
IHSS	HPGe	NaI PROBE	Vertical Profile	Geophysical Surveys	Soil Gas	Asphalt or Concrete	Surface Water	Sediment	RADs[1]	VOCs[2]	SVOCs	TAL Metals	Total Chromium	TPH	Tritium	Anions	SVOCs	TAL Metals	pH
118.1					X					X									
118.2					X					X									
123.1	X		X		X					X		X							
135																X		X	X
137													X		X				
138	X		X										X						
139.1 N,S													X						
139.2																			X
144 (N)	X		X		X			X	X	X	X	X				X			X
144 (S)					X					X							X	X	
150.1	X		X		X					X							X	X	
150.2	X		X							X							X	X	
150.3	X		X		X														
150.4	X		X		X					X							X	X	
150.6 /150.8	X		X		X					X								X	
150.7	X		X														X	X	
151					X														
163.1	X		X		X					X				X					
163.2				X						X				X		X		X	
172	X	X	X																
173	X		X		X														
184	X		X							X								X	
188																X	X	X	X

[1] Includes total plutonium, total americium, tritium, U-233/234, U-235, U-238, gross alpha, and gross beta.
[2] See Table 8.2 of OU8 Work Plan for specific analytes.

Notes: X = analyte sample
HPGe = High purity germanium
NaI = Sodium Iodide
PCBs = Polychlorinated biphenols
RADs = Full radionuclide analysis
SVOCs = Semivolatile organic compounds
TAL = Target analyte list
TPH = Total petroleum hydrocarbon
VOCs = Volatile organic compounds

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TABLE 4-2
SUMMARY OF THE ANALYTICAL PROGRAM FOR NONINTRUSIVE SAMPLE ACTIVITIES
OPERABLE UNIT 9
ROCKY FLATS PLANT

	Radiological Survey			Specific Tasks					Specific Task Analyses					Surface Soil Analyses					
Tank	HPGe	NaI Probe	Vertical Profile	Residue or Wipe	Vault Water	Asphalt or Concrete	Surface Water	Sediment	RADs[1]	VOCs	SVOCs	TAL Metals	PCBs	VOCs	SVOCs	PCBs	RADs	TAL Metals	pH
T-1	X	X																	
T-2, T-3	X	X		X	X				X	X	X	X	X	X	X	X	X[1]	X	
T-7	X	X																	
T-8																			
T-9																			
T-10	X	X		X					X	X	X	X							
T-11, T-30																			
T-14, T-16	X	X		X					X	X	X	X							
T-15, T-17	X	X																	
T-21, T-22	X	X		X	X				X	X	X	X							
T-24																			
T-27	X	X																	
T-29	X	X		X	X				X	X	X	X		X	X		X[2]	X	
T-32														X	X		X[1]	X	X

[1] Radiological analyses include U-233/234, U-233/234, U-235, U-238, americium 241, plutonium 239, plutonium 240, gross alpha, and gross beta. Wipe samples will be analyzed for quantitative radionuclides only.

[2] Radiological analyses include U-233/234, U-233/234, U-235, U-238, americium 241, plutonium 239, plutonium 240, gross alpha, and gross beta, and cesium 137.

Notes:

X = analyte sample
HPGe = High purity germanium
NaI = Sodium Iodide
PCBs = Polychlorinated biphenols
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
TAL = *Target analyte list*
TPH = Total petroleum hydrocarbon
RADs = *Full radionuclide analysis*

TABLE 4-3
SUMMARY OF THE ANALYTICAL PROGRAM FOR NONINTRUSIVE SAMPLE ACTIVITIES
OPERABLE UNIT 10
ROCKY FLATS PLANT

	Radiological Survey			Specific Tasks					Specific Task Analyses				Surface Soil Analyses							
IHSS	HPGe	NaI Probe	Vertical Profile	Residue or Wipe	Soil Gas [1]	Asphalt or Concrete	Surface Water	Sediment	PCBs	VOCs	SVOCs	TAL Metals	PCBs	pH	Tritium	Cyanide	RADs	Lab HPGe	TAL Metals	SVOCs
129				X	X					X	X	X							X	X
170	X				X								X			X			X	X
174A, B	X	X			X								X			X			X	X
175	X	X			X								X						X	X
176	X				X								X						X	X
177	X	X			X								X						X	X
181	X	X			X								X						X	X
182	X	X			X															
205				X						X	X	X								
206															X				X	
207	X	X																		
208														X		X			X	X
210					X								X						X	X
213	X												X						X	X
214	X																		X	X

[1] See Table 7-5 of OU10 Work Plan for specific analytes.

Notes:

X = analyte sample
HPGe = High purity germanium
NaI = Sodium iodide
PCBs = Polychlorinated biphenols
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
TAL = Target analyte list
TPH = Total petroleum hydrocarbon
RADs = Full radionuclide analysis

TABLE 4-4
SUMMARY OF THE ANALYTICAL PROGRAM FOR NONINTRUSIVE SAMPLE ACTIVITIES
OPERABLE UNIT 12
ROCKY FLATS PLANT

	Radiological Survey			Specific Tasks					Specific Task Analyses						Surface Soil Analyses					
IHSS	HPGe	NaI Probe	Vertical Profile	Geophysical Surveys	Soil Gas[1]	Asphalt or Concrete	Surface Water	Sediment	Lab HPGe[2]	VOCs	SVOCs	TAL Metals	RADs[3]	PCBs	TAL Metals	Anions	RADs[3,4]	Lab HPGe[2]	Physical Parameters	pH
116.1	X	X	X		X	X		X	X	X		X	X	X	X		X	X		
116.2	X	X			X	X		X		X		X	X	X	X		X	X		
120.1	X	X	X		X										X			X		
120.2	X	X	X		X	X			X						X		X	X		
136.1	X	X				X		X	X	X		X	X	X	X		X	X		
136.2	X	X	X					X		X		X	X	X	X		X	X		
147.2	X	X	X									X			X		X	X		
157.2	X	X	X		X	X		X		X		X	X	X	X		X	X		
187																				X
189																				X

[1] See Table 6.4 of OU10 Work Plan for specific analytes.

[2] Lab HPGe analyses include potassium-40, radium-226, thorium-232, U-238, U-235, cesium-137, americium-241, and plutonium-239.

[3] Radionuclide analyses include total plutonium, americium-241, total uranium, total strontium, cesium-137, and tritium.

[4] This analysis is performed for confirmation purposes of the Lab HPGe results.

Notes:

X = analyte sample
HPGe = High purity germanium
NaI = Sodium Iodide
PCBs = Polychlorinated biphenols
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
TAL = Target analyte list
TPH = Total petroleum hydrocarbon
RADs = Full radionuclide analysis

TABLE 4-5
SUMMARY OF THE ANALYTICAL PROGRAM FOR NONINTRUSIVE SAMPLE ACTIVITIES
OPERABLE UNIT 13
ROCKY FLATS PLANT

	Radiological Survey			Specific Tasks				Specific Task Analyses				Surface Soil Analyses								
IHSS	HPGe	NaI Probe[1]	Vertical Profile[1]	Geophysical Surveys	Soil Gas	Asphalt or Concrete	Vault Water	TAL Metals	Lab HPGe[2]	VOCs[3]	SVOCs	TAL Metals	Lithium	Magnesium	Tritium	Anions	RADs[4]	Lab HPGe[2]	Physical Parameters	pH
117.1/197	X	X	X		X					X		X					X	X		
117.2	X	X	X		X	X			X	X		X					X	X		
117.3	X	X			X					X		X					X	X		
128/134(N)	X	X			X					X			X	X			X	X		
134 S	X	X	X		X	X			X	X		X	X				X	X		
148	X	X	X		X	X			X	X							X	X		
152					X					X										
157.1	X	X	X		X					X		X					X	X		
158	X	X	X		X					X		X					X	X		
171	X	X	X		X		X	X	X	X	X		X	X			X	X		
186	X	X	X		X					X							X	X		

Notes:

[1] Performed only if elevated readings were observed during the HPGe survey.

[2] Lab HPGe analysis includes potassium-40, radium-226, thorium-232, U-238, U-235, cesium-137, americium-241, and plutonium-239.

[3] See Section 6.3 of OU13 Work Plan for specific soil gas analytes to be tested per IHSS.

[4] Radionuclide analyses include total plutonium, americium-241, total uranium, total strontium, cesium-137, and tritium.

This analysis is performed for confirmation purposes of the Lab HPGe results.

X = analyte sample
HPGe = High purity germanium
NaI = Sodium iodide
PCBs = Polychlorinated biphenols
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
TAL = Target analyte list
TPH = Total petroleum hydrocarbon
RADs = Full radionuclide analysis

TABLE 4-6
SUMMARY OF THE ANALYTICAL PROGRAM FOR THE INDUSTRIAL AREA OPERABLE UNITS
OPERABLE UNIT 14
ROCKY FLATS PLANT

	Radiological Survey			Specific Tasks					Specific Task Analyses			Surface Soil Analyses								
IHSS	HPGe	NaI Probe	Vertical Profile	Geophysical Surveys	Soil Gas	Asphalt or Concrete	Surface Water	Sediment	PCBs	VOCs	SVOCs	TAL Metals	Lithium	TPH	Tritium	Anions	RADs	Lab HPGe	Physical Parameters	pH
131																				
156.1	X	X															a			
160	X	X			X					X							a			
161	X	X			X					X							b			
162	X	X															b			
164.1	X	X															b			
164.2	X	X															a			
164.3	X	X															a			
																	a			

Notes:

X = analyte sample
HPGe = High purity germanium
NaI = Sodium iodide
PCBs = Polychlorinated biphenols
VOCs = Volatile organic compounds
SVOCs = Semivolatile organic compounds
TAL = Target analyte list
TPH = Total petroleum hydrocarbon
RADs = Full radionuclide analysis

a Radionuclide analyses include total plutonium, total americium, U-233/234, U-235, U-238, gross alpha, and gross beta.

b Radionuclide analyses include total plutonium, U-233/234, U-235, U-238, gross alpha, and gross beta.

in Appendix B. Analytical results from the Phase I sampling activities may dictate changes to future analytical suites for each sample media.

4.3 SAMPLE CONTAINERS AND PRESERVATIVES

The type of analysis and medium to be sampled dictates the type of sample container, volume and material requirements, preservation techniques, and holding times. Information about sample containers and preservatives is provided in EG&G's Environmental Management Division SOP FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples. The containers, preservatives, and holding times associated with the Phase I sampling activities are listed in Tables 4-8 and 4-9. These tables were derived from the associated tables found within the Integrated OU Work Plans and, therefore, represent a consistent basis for these requirements.

4.4 SAMPLE HANDLING AND DOCUMENTATION

Sample handling and documentation is necessary to ensure the defensibility of data and to verify the quality and quantity of work performed in the field. Accountability documents include logbooks, data collection forms, sample labels or tags, chain-of-custody records, and field data documentation. Information relating to documentation of samples, packaging, and shipping is provided in EG&G's Environmental Management Division SOP FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples. Field data and reporting requirements are discussed in detail in EG&G's Environmental Management Division SOP FO.14, Field Data Management. These SOPs were consistently referenced for these activities throughout the RFI/RI Work Plans. EG&G's SOPs are taken from the site-wide QAPjP for RFP (EG&G 1991).

TABLE 4-7
PHASE I SOURCE, SOIL, SEDIMENT, WATER, AND SOIL GAS TARGET ANALYTE LIST AND DETECTION/QUANTITATION LIMITS ROCKY FLATS PLANT

Target Analyte List	DETECTION LIMITS*		
	Water (µg/l)	Soil/Sediment (mg/kg)	Soil Gas[1] (µg/l)
Metals and Cyanide			
Aluminum	200	40	-
Antimony	60	12	-
Arsenic	10	2	-
Barium	200	40	-
Beryllium	5	1.0	-
Cadmium	5	2.0	-
Calcium	5,000	2,000	-
Chromium	10	2.0	-
Cobalt	50	10	-
Copper	25	5.0	-
Cyanide	10	10	-
Iron	100	20	-
Lead	5	1.0	-
Magnesium	5,000	2,000	-
Manganese	15	3.0	-
Mercury	0.2	0.2	-
Nickel	40	8.0	-
Potassium	5,000	2,000	-
Selenium	5	1.0	-
Silver	10	2.0	-
Sodium	5,000	2,000	-
Thallium	10	2.0	-
Vanadium	50	10.0	-
Zinc	20	4.0	-
Other Metals			
Lithium	100	20	-
Molybdenum	200	40	-
Tin	200	40	-

TABLE 4-7
PHASE I SOURCE, SOIL, SEDIMENT, WATER, AND SOIL GAS
TARGET ANALYTE LIST AND DETECTION/QUANTITATION LIMITS
ROCKY FLATS PLANT

Target Analyte List	DETECTION LIMITS*		
	Water (µg/l)	Soil/Sediment (mg/kg)	Soil Gas[1] (µg/l)
Volatile Organics			
Chloromethane	10	10	0.01
Bromomethane	10	10	0.01
Vinyl Chloride	10	10	0.01
Chloroethane	10	10	0.01
Methylene Chloride	5	5	0.01
Acetone	10	10	0.01
Carbon Disulfide	5	5	-
1,1-Dichloroethene	5	5	0.01
1,1-Dichloroethane	5	5	0.01
1,2-Dichloroethene (total)	5	5	-
Chloroform	5	5	0.01
1,2-Dichloroethane	5	5	0.01
2-Butanone	10	10	-
1,1,1-Trichloroethane	5	5	0.01
Carbon Tetrachloride	5	5	0.01
Vinyl Acetate	10	10	-
Bromodichloromethane	5	5	0.01
1,2-Dichloropropane	5	5	0.01
cis-1,3-Dichloropropene	5	5	-
Trichloroethene	5	5	0.01
Dibromochloromethane	5	5	0.01
1,1,2-Trichloroethane	5	5	0.01
Benzene	5	5	0.01
trans-1,3-Dichloropropane	5	5	-
Bromoform	5	5	0.01
4-Methyl-2-pentatone	10	10	-
2-Hexanone	10	10	-
Tetrachloroethene	5	5	0.01
Toluene	5	5	0.01
1,1,2,2-Tetrachloroethane	5	5	0.01
Chlorobenzene	5	5	0.01

TABLE 4-7
PHASE I SOURCE, SOIL, SEDIMENT, WATER, AND SOIL GAS
TARGET ANALYTE LIST AND DETECTION/QUANTITATION LIMITS
ROCKY FLATS PLANT

Target Analyte List	DETECTION LIMITS*		
	Water (µg/l)	Soil/Sediment (mg/kg)	Soil Gas[1] (µg/l)
Ethyl Benzene	5	5	0.01
Styrene	5	5	0.01
Total Xylenes	5	5	0.01
Bromobenzene	-	-	0.01
Bromochloromethane	-	-	0.01
n-Butylbenzene	-	-	0.01
Sec-Butylbenzene	-	-	0.01
tert-Butylbenzene	-	-	0.01
2-Chlorotoluene	-	-	0.01
4-Chlorotoluene	-	-	0.01
Dibromomethane	-	-	0.01
Dichlorodiflouromethane	-	-	0.01
Cis-1,2-Dichloroethene	-	-	0.01
trans-1,2-Dichloroethene	-	-	0.01
1,3-Dichloropropene	-	-	0.01
2,2-Dichloropropane	-	-	0.01
1,1-Dichloropropene	-	-	0.01
Isopropylbenzene	-	-	0.01
p-Isopropyltoluene	-	-	0.01
n-Propylbenzene	-	-	0.01
1,2,3-Trichlorobenzene	-	-	0.01
Trichloroflouromethane	-	-	0.01
1,2,3-Trichloropropane	-	-	0.01
1,2,4-Trimethylbenzene	-	-	0.01
1,3,5-Trimethylbenzene	-	-	0.01
Semivolatiles			
Phenol	10 **	330	-
bis(2-Chloroethyl)ether	10 **	330	-
1,3-Dichlorobenzene	10	330	0.01
1,4-Dichlorobenzene	10	330	0.01
Benzyl alcohol	10	330	-
1,2-Dichlorobenzene	10	330	0.01

TABLE 4-7
PHASE I SOURCE, SOIL, SEDIMENT, WATER, AND SOIL GAS TARGET ANALYTE LIST AND DETECTION/QUANTITATION LIMITS ROCKY FLATS PLANT

Target Analyte List	DETECTION LIMITS*		
	Water (µg/l)	Soil/Sediment (mg/kg)	Soil Gas[1] (µg/l)
2-Methylphenol	10	330	-
bis(2-Chloroisopropyl)ether	10	330	-
4-Methylphenol	10	330	-
N-Nitroso-di-n-propylamine	10	330	-
Hexachloroethane	10	330	-
Nitrobenzene	10 **	330	-
Isophorone	10	330	-
2-Nitrophenol	10	330	-
2,4-Dimethylphenol	10	330	-
Benzoic acid	50	1,600	-
bis(2-Chloroethoxy)methane	10	330	-
2,4-Dichlorophenol	10	330	-
1,2,4-Trichlorobenzene	10	330	0.01
Naphthalene	10	330	0.01
4-Chloroaniline	10	330	-
Hexachlorobutadiene	10	330	0.01
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	10	330	-
2-Methylnaphthalene	10	330	-
Hexachlorocyclopentadiene	10	330	-
2,4,6-Trichlorophenol	10	330	-
2,4,5-Trichlorophenol	50	1,600	-
2-Chloronaphthalene	10	330	-
2-Nitroaniline	50	1,600	-
Dimethylphthalate	10	330	-
Acenaphthylene	10	330	-
2,6-Dinotrotoluene	10	330	-
3-Nitroaniline	50	1,600	-
Acenaphthene	10	330	-
2,4-Dinintrophenol	50	1,600	-
4-Nitrophenol	50	1,600	-
Dibenzofuran	10	330	-
2,4-Dinitrotoluene	10	330	-

TABLE 4-7
PHASE I SOURCE, SOIL, SEDIMENT, WATER, AND SOIL GAS
TARGET ANALYTE LIST AND DETECTION/QUANTITATION LIMITS
ROCKY FLATS PLANT

Target Analyte List	DETECTION LIMITS*		
	Water (µg/l)	Soil/Sediment (mg/kg)	Soil Gas[1] (µg/l)
Diethylphthalate	10	330	-
4-Chlorophenyl-phenyl ether	10	330	-
Fluorine	10	330	-
4-Nitroaniline	50	1,600	-
4,6-Dinitro-2-methylphenol	50	1,600	-
N-nitrosodiphenylamine	10	330	-
4,-Bromophenyl-phenylether	10	330	-
Hexachlorobenzene	10 **	330	-
Pentachlorophenol	50	1,600	-
Phenanthrene	10	330	-
Anthracene	10	330	-
Di-n-butylphthalate	10	330	-
Fluoranthene	10	330	-
Pyrene	10	330	-
Butylbenzylphalate	10	330	-
3,3'-Dichlorobenzidine	20 **	330	-
Benzo(a)anthracene	10	330	-
Chrysene	10	330	-
bis(2-Ethylhexyl)phthalate	10	330	-
Di-n-octylphthalate	10	330	-
Benzo(b)fluoranthene	10	330	-
Benzo(k)fluoranthene	10	330	-
Benzo(a)pyrene	10	330	-
Indeno(1,2,3-cd)pyrene	1-	330	-
Dibenz(a,h)anthracene	10	330	-
Benzo(g,h,i)perylene	10	330	-
Pesticides			
alpha-BCH	0.05	8.0	-
beta-BCH	0.05	8.0	-
delta-BCH	0.05	8.0	-
gamma-BCH (Lindane)	0.05	8.0	-
Heptachlor	0.05 **	8.0	-

TABLE 4-7
PHASE I SOURCE, SOIL, SEDIMENT, WATER, AND SOIL GAS
TARGET ANALYTE LIST AND DETECTION/QUANTITATION LIMITS
ROCKY FLATS PLANT

Target Analyte List	DETECTION LIMITS*		
	Water (µg/l)	Soil/Sediment (mg/kg)	Soil Gas[1] (µg/l)
Aldrin	0.05 **	8.0	-
Heptachlor epoxide	0.05 **	8.0	-
Endosulfan I	0.05	8.0	-
Dieldrin	0.10	16.0	-
4,4'-DDE	0.10	16.0	-
Endrin	0.10	16.0	-
Endosulfan II	0.10	16.0	-
Endosulfin sulfate	0.10	16.0	-
4,4'DDD	0.10	16.0	-
4,4'-DDT	0.10	16.0	-
Methoxychlor	0.5	80.0	-
Endrin ketone	0.10	16.0	-
alpha-Chlordane	0.5 **	80.0	-
gamma-Chlordane	0.5 **	80.0	-
Toxaphene	1.0	160.0	-
PCBs			
Aroclor-1016	0.5 **	80.0	-
Aroclor-1221	0.5 **	80.0	-
Aroclor-1232	0.5 **	80.0	-
Aroclor-1242	0.5 **	80.0	-
Aroclor-1248	0.5 **	80.0	-
Aroclor-1254	1.0 **	160.0	-
Aroclor-1260	1.0 **	160.0	-
Anions			
Carbonate	10,000	-	-
Bicarbonate	10,000	-	-
Chloride	5,000	-	-
Sulfate	5,000	-	-
Nitrate/Nitrite	1,000	-	-
Fluoride	5,000	-	-

TABLE 4-8
SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES FOR WATER SAMPLES ROCKY FLATS PLANT

PARAMETER	CONTAINER	PRESERVATIVE	HOLDING TIME
Liquid Samples - Low to Medium Concentration			
Organic Compounds:			
Purgeable organics (VOCs)	2 x 40 ml VOA vials with Teflon-lined septum lids	Cool, 4°C[a] with HCL to pH <2	7 days 14 days
Extractable organics (BNAs), pesticides, and PCBs	1 x 4 l amber[b] glass bottle	Cool, 4°C	7 days until extraction, 40 days after extraction
Inorganic Compounds:			
Metals (TAL)	1 x 1 l polyethylene bottle	Nitric acid pH<2; cool, 4°C	180 days[c]
Cyanide	1 x 1 l polyethylene bottle	Sodium hydroxide[d] pH>12; cool, 4°C	14 days
Anions	1 x 1 l polyethylene bottle	Cool, 4°C	14 days
Sulfide	1 x 1 l polyethylene bottle	1 ml zinc acetate sodium hydroxide to pH>9; cool, 4°C	7 days
Nitrate	1 x 1 l polyethylene bottle	Cool, 4°C	48 hours
Total dissolved solids (TDS)	1 x 1 l polyethylene bottle	Cool, 4°C	48 hours
Radiological Compounds:			
Radionuclides[e]	1 x 1 gallon plastic	Nitric acid pH<2	180 days

[a]Add 0.008 percent sodium thiosulfate ($Na^2S^2O^3$) in the presence of residual chlorine.
[b]Container requirement is for any or all of the parameters given.
[c]Holding time for mercury is 28 days.
[d]Use ascorbic acid only if the sample contains residual chlorine. Test a drip of sample with potassium iodine-starch test paper; a blue color indicates need for treatment. Add ascorbic acid, a few crystals at a time, until a drop of sample produces no color on the indicator paper. Then add an additional 0.6 g of ascorbic acid for each liter of sample volume.
[e]For radiological testing, the specific analyses will be defined as some or all of the following: gross alpha, gross beta, uranium 233/234, 235, and 238, americium 241, plutonium 239/240, tritium, strontium 89/90, cesium 137, and radium 226,288.

BNA = Base Neutral Acids
TAL = target analyte list
VOC = volatile organic compound

TABLE 4-9
SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES FOR SOIL SAMPLES ROCKY FLATS PLANT

PARAMETER	CONTAINER	PRESERVATIVE	HOLDING TIME
Soil or Sediment Samples - Low to Medium Concentration			
Organic Compounds:			
Purgeable organics (VOCs)	1 x 4 oz wide-mouth teflon-lined glass vials	Cool, 4°C	7 days 14 days
Extractable organics (BNAs), pesticides, and PCBs	1 x 8 oz wide-mouth teflon-lined glass vials	Cool, 4°C	7 days until extraction, 40 days after extraction
Inorganic Compounds:			
Metals (TAL)	1 x 8 oz wide-mouth glass jar	Cool, 4°C	180 days[a]
Cyanide	1 x 8 oz wide-mouth glass jar	Cool, 4°C	14 days
Sulfide	1 x 8 oz wide-mouth glass jar	Cool, 4°C	28 days
Nitrate	1 x 8 oz wide-mouth glass jar	Cool, 4°C	48 hours
Radiological Compounds:			
Radionuclides[b]	1 x 1 liter glass jar	None	None

[a] Holding time for mercury is 28 days

[b] For radiological testing, the specific analyses will be defined as some or all of the following: gross alpha, gross beta, uranium 233/234, 235, and 238, americium 241, plutonium 239/240, tritium, strontium 89/90, cesium 137, and radium 226, 288.

BNA = Base Neutral Acids
TAL = target analyte list
VOC = volatile organic compound

5.0 FIELD SAMPLING QUALITY ASSURANCE FREQUENCY AND PROCEDURES

Field quality control procedures for surface soil, surface water, and soil-gas sampling are discussed in this section. The analytical results obtained for the QC samples will be used by the EG&G project manager to provide measures of the internal consistency of sampling procedures and storage practices. The types and functions of field QC samples to be collected are discussed in the following subsections. The frequencies with which QC samples will be collected are provided in Table 5-1. For further information about field sampling QA, refer to the Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigations/Feasibility Studies and RCRA Facility Investigation/Corrective Measures Studies Activities (EG&G 1991).

5.1 FIELD DUPLICATES

Field duplicate samples are collected and analyzed to provide an indication of overall sampling and analytical precision. Field duplicates are collected following the same sampling procedures used to obtain the original sample. Often, a field duplicate is obtained when a sample from one location is split into two equal portions, with each portion going to the laboratory in a separate

TABLE 5-1
FIELD QC SAMPLE FREQUENCY
ROCKY FLATS PLANT

Sample Type	Type of Analysis	Media		
		Solids	Liquids	Soil Gas
Field Duplicates	Organics	1/20	1/20	1/20
	Inorganics	1/20	1/20	NA
	Radionuclides	1/20	1/20	NA
Field Preservation Blanks	Organics	NA	1/20	NA
	Inorganics	NA	1/20	NA
	Radionuclides	NA	NA	NA
Equipment Blanks	Organics	1/20*	1/20*	1 Per Day
	Inorganics	1/20*	1/20*	NA
	Radionuclides	1/20*	1/20*	NA
Trip Blanks	Organics	NR	1/20	1/20
	Inorganics	NR	NR	NA
	Radionuclides	NR	NR	NA

NOTES:

NA = Not Applicable
NR = Not Required
1/20 = A minimum of 1 QC sample per 20 samples collected
1/20* = 1 QC sample per 20 samples collected or 1 QC sample per day, whichever is more frequent
1 Per Day = 1 QC sample per day and before reuse of recleaned sampling equipment

Source: EG&G 1991

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container. Exceptions to splitting samples to obtain a duplicate apply to samples collected for volatile organic analysis. Duplicate samples collected for volatile organic analysis will be collected independently from the original sample to reduce the possibility of volatilization during sample collection. One field duplicate sample will be collected for 20 samples taken.

Field duplicate samples will be obtained for the following types of samples in accordance with the referenced EG&G Environmental Management Division SOPs:

Sample Media	EMD Standard Operating Procedure
Soil Gas	GT.3.9
Surface Water/Sediment	GT.4.6
Surface Soil	GT.3.8

5.2 FIELD BLANKS

Field blank samples prepared for a QC program associated with a water-based media (i.e., surface water, groundwater, etc.) consist of volatile-free American Society for Testing and Materials (ASTM) Type II reagent water. These QC samples are prepared in the field in the same manner as regular samples. The field blanks serve to identify contamination potentially associated with sample collection, preparation, and transportation. Field blanks for surface water sampling are obtained by preparing a sample bottle of the reagent water following the same preparation procedures that are applicable to a regular sample, including filtering and adding preservatives as appropriate. The field blank sample is then transported with the regular samples to the laboratory for analysis. The field blanks are analyzed in the laboratory as if they were regular samples. Field blanks must be prepared once every 20 samples.

The use of field blanks for soil and sediment sampling at RFP is not appropriate because of the lack of commercially available blank soils and solid materials that adequately reflect the various soil types encountered. Developing blank soil types within the RFP region is not practical due to the subjectivity of characterizing background soil conditions and the variability of soil types.

5.3 EQUIPMENT RINSATE BLANKS

Equipment rinsate blanks will be obtained when sample collection requires the use of sampling equipment. Analyses of equipment rinsates are used to assess the effectiveness of equipment decontamination SOPs. The procedure for collecting rinsate blanks consists of pouring volatile-free ASTM Type II reagent water into, through, or over decontaminated sampling equipment (such as a bailer) and then collecting it into prepared sample bottles. A sample container appropriate for each type of analysis for which environmental samples are being collected will be selected. The equipment rinsate blank sample is then transported with the regular samples to the laboratory for analysis. Equipment rinsate blanks will be collected once every 20 samples or once per day, whichever is more frequent.

5.4 TRIP BLANKS

Trip blanks serve to assess the potential for cross contamination of VOCs within sample containers used during storage, sample collection, and transport activities. Trip blanks consist of volatile-free ASTM Type II reagent water that will be prepared by a laboratory. The trip blanks will be shipped to the sampling site with the regular sample bottles and then transported back for analysis with the samples collected during the sampling event. The trip blanks will remain unopened throughout the sampling event. The trip blanks will be prepared and analyzed

at the laboratory as if they were regular samples. Trip blanks are associated with organic analysis samples only.

Trip blanks for soil-gas analysis will consist of unused sample cartridges transported into the field with the sampling equipment. The trip blank cartridge will be handled in the same manner as a sample, but a sample will not be collected through the cartridge. The frequency of trip blank preparation for both liquid and soil-gas media is one every 20 samples.

6.0 DATA MANAGEMENT AND REPORTING

This section outlines the data management procedures to be followed for the inventory control storage and retrieval of data (both field and other data) collected during the performance of the nonintrusive activities for the Integrated OUs. The procedures contained in this section are designed to maintain the integrity of data collected for subsequent use. Moreover, project tracking data (e.g., schedules, progress reports, and financial reports) will be maintained to monitor, manage, and document the progress of the investigation. The analytical laboratories for the project are under separate contract to EG&G; therefore, the analytical data for the project will be managed in accordance with that contract.

6.1 FIELD DATA

Field data will be input to the RFEDS using a DATACAP remote data entry module supplied by EG&G. The data sample coordinator will enter data daily. A 3.5-inch computer diskette containing pertinent data information will be delivered to EG&G weekly. A hard copy report will be generated from the module for EG&G's subcontractor's use. The data will undergo a prescribed QC process based on EG&G's Environmental Management Division SOP FO.14, Revision 2, Field Data Management.

A sample tracking spreadsheet will be maintained by the EG&G subcontractor for use in tracking sample collection and shipments. EG&G will supply the spreadsheet format and will stipulate timely reporting of information. These data will also be delivered weekly to EG&G on 3.5-inch computer diskettes. Computer hardware and software equipment will be supplied by EG&G. Computer and data security measures will follow acceptable procedures outlined by EG&G. Any updates or changes to the RFEDS system will be incorporated, when appropriate.

6.2 MISCELLANEOUS DATA AND REPORTS

Project files containing miscellaneous data and reports generated during the nonintrusive field activities will be maintained at each EG&G subcontractor's office. Procedures controlling the receipt and distribution of all incoming and outgoing data and reports related to the project are outlined in the following sections.

6.2.1 Receipt of Data and Reports

A document control clerk will be responsible for recording the type of document received, the date received, document date, and its originating organization. A control number will be assigned and entered into a database. The document control numbers will be organized in the following format; (VVVVVVVV) (XXXXX)-(YYYYY) where:

(VVVVVVVV)	is the project number;
(XXXXX)	refers to the originating organization; and
(YYYYY)	is the sequential serial number assigned to each particular document.

Codes for each originating organization will be assigned as follows:

JE	Jacobs Engineering
EG	EG&G
DOE	Department of Energy
EPA	United States Environmental Protection Agency
CDH	Colorado Department of Health

If distribution is required, the appropriate number of copies will be made and distributed. The original document that is received will be kept in the document control file.

6.2.2 Outgoing Data and Reports

The document control clerk will maintain a log of all project data and reports sent out. All outgoing project data and reports will be assigned a document control number. The document control numbers will be organized according to the following format: (VVVVVVVV)-(YYYYY), where (VVVVVVVV) is the project number, and (YYYYY) is the sequential serial number assigned to a particular document. All outgoing reports and maps will receive a rigorous technical and peer review.

6.2.3 Telephone Logs and Meeting Notes

All notes from project meetings and telephone conversations will be maintained by personnel assigned to the project. These notes will be retained by project personnel until the conclusion of the project at which time they will be filed with the original project documents.

6.3 ACCESS TO PROJECT FILES

Access to project files will be controlled and limited to EG&G's subcontractor personnel only. Authorized EG&G personnel can access specific files during normal working hours. To facilitate retrieval, a computer log will be maintained for all documents contained in the file. Project documents will be listed by document control number. The document control clerk will maintain the original files.

7.0 SCHEDULE

EG&G will supply a schedule for the Integrated OU nonintrusive activities discussed in this section of the report. This schedule will present the sampling sequence for collection of surface radiation surveys, surface water and sediment sampling, concrete and asphalt sampling, soil gas sampling, tank and pipeline inspections, surface soil sampling, vertical soil profile sampling, and surface geophysical surveys. The sequence of activities will be based on the status of work plan approval and funding issues. Currently, the OU 8 and the OU14 Work Plans have not been approved by the regulatory agencies.

8.0 REFERENCES

EG&G Rocky Flats, Inc. 1991. *Rocky Flats Plant Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigation/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities.* Environmental Restoration Program, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992a. *Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Rocky Flats Plant, 700 Area, Operable Unit No. 8.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992b. *Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Rocky Flats Plant, Original Process Waste Lines, Operable Unit No. 9.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992c. *Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Rocky Flats Plant, Other Outside Closures, Operable Unit No. 10.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992d. *Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Rocky Flats Plant, 400/800 Area, Operable Unit No. 12.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992e. *Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Rocky Flats Plant, 100 Area, Operable Unit No. 13.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992f. *Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Rocky Flats Plant, Radioactive Sites, Operable Unit No. 14.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

EG&G Rocky Flats, Inc. 1992g. *Environmental Management Department Operating Procedures, Volume I: Field Operations.* Manual No. 5-21000-OPS-FO. Rocky Flats Plant, Golden, Colorado.

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Jacobs Engineering Group Inc. 1994a. *Technical Addendum to Phase I, Memorandum No. 1.* Addendum to Phase I Remedial Field Investigation/Remedial Investigation Work Plan, Field Sampling Plan, Original Process Waste Lines. Volume I - Tanks, Operable Unit 9. Rocky Flats Plant, Golden, Colorado.

Jacobs Engineering Group Inc. 1994b. *Draft Technical Memorandum No. 1.* Addendum to Field Sampling Plan, 100 Area, Operable Unit 13. Rocky Flats Plant, Golden, Colorado.

U.S. Department of Energy. 1988. *Resource Conservation and Recovery Act Closure Plan, Original Process Waste Lines.* U.S. Department of Energy, Rocky Flats Plant, Golden, Colorado.

U.S. Department of Energy. 1992a (June). *Historical Release Report for the Rocky Flats Plant, Golden, Colorado.* U.S. Department of Energy, Environmental Restoration Program.

U. S. Department of Energy. 1992b (February). *Rocky Flats Plan for Prevention of Contaminant Dispersion.* U.S. Department of Energy, Environmental Restoration Program.

U. S. Department of Energy. 1993. *Rocky Flats Plant, Fiscal Year 1993, Site-Specific Plan.* Rocky Flats Plant, Golden, Colorado.

U.S. Environmental Protection Agency, U.S. Department of Energy, and the State of Colorado. 1991 (January 22). *Federal Facilities Agreement and Consent Order (Interagency Agreement).* CERCLA-VIII-91-03, RCRA(3008(h))-VIII-91-07, CDH Docket No. 91-01-22-01.

Fences

Rocky Flats boundary

Paved roads

Dirt roads

Scale = 1 : 200
1 inch represents 200 feet

200 0 400 800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Plant

Prepared by:

EG&G ROCKY FLATS

Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80402-0464

PROJECT NO.
None Assigned
MAP ID
*** Draft ***
DATE CREATED
March 18, 1994

PLATE 1

INTEGRATED OPERABLE UNIT

SITE PLAN

122/170

N 748,019

2,086,700

TABLE A-1

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

INDICATORS							
Total Organic Carbon	EPA 415[a]	X[b]		5 mg/L			
	ASTM D4129-82	X			20%RPD[c]	80-120% Recovery	LCS
INORGANICS							
Target Analyte List - Metals		X[f]	X				
Aluminum	EPA CLP SOW[e]				WATER/SOIL	WATER/SOIL	
Antimony	EPA CLP SOW[e]			200 ug/L[d]	40 mg/Kg[d]	**	***
Arsenic (GFAA)	EPA CLP SOW[e]			60	12		
Barium	EPA CLP SOW[e]			10	2		
Beryllium	EPA CLP SOW[e]			200	40		
Cadmium	EPA CLP SOW[e]			5	1.0		
Calcium	EPA CLP SOW[e]			5	1.0		
Chromium	EPA CLP SOW[e]			5000	2000		
Cobalt	EPA CLP SOW[e]			10	2.0		
Copper	EPA CLP SOW[e]			50	10		
Cyanide	EPA 335.3 (modified for CLP)[e,g]			25	5.0		
Iron	EPA CLP SOW[e]			5	10		
Lead (GFAA)	EPA CLP SOW[e]			100	20		
Magnesium	EPA CLP SOW[e]			3	1.0		
Manganese	EPA CLP SOW[e]			5000	2000		
Mercury (CVAA)	EPA CLP SOW[e]			15	3.0		
Nickel	EPA CLP SOW[e]			0.2	0.2		
Potassium	EPA CLP SOW[e]			40	8.0		
Selenium (GFAA)	EPA CLP SOW[e]			5000	2000		
Silver	EPA CLP SOW[e]			5	1.0		
Sodium	EPA CLP SOW[e]			10	2.0		
Thallium (GFAA)	EPA CLP SOW[e]			5000	2000		
Vanadium	EPA CLP SOW[e]			10	2.0		
Zinc	EPA CLP SOW[e]			50	10		
				20	4.0		

TABLE A-1 (CONTINUED)

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

ANIONS								
Sulfate	EPA 375.4[4]		X				Water/Soil	Water/Soil
Nitrate as N	EPA 353.2[4] or 353.3[4]	X[5]	X					
Fluoride	(TBD)		X		1 mg/L		Same as Metals	Same as Metals
Target Compound List - Volatiles		X[5]	X					
Chloromethane	EPA CLP SOW[6]			10	ug/L	10 ug/Kg (low)[3]	WATER/SOIL	WATER/SOIL
Bromomethane	EPA CLP SOW[6]			10		10	**	***
Vinyl Chloride	EPA CLP SOW[6]			10		10		
Chloroethane	EPA CLP SOW[6]			10		10		
Methylene Chloride	EPA CLP SOW[6]			5		5		
Acetone	EPA CLP SOW[6]			10		10		
Carbon Disulfide	EPA CLP SOW[6]			5		5		
1,1-Dichloroethene	EPA CLP SOW[6]			5		5		
1,1-Dichoroethane	EPA CLP SOW[6]			5		5		
total 1,2-Dichloroethene	EPA CLP SOW[6]			5		5		
Chloroform	EPA CLP SOW[6]			5		5		
1,2-Dichloroethane	EPA CLP SOW[6]			5		5		
2-Butanone	EPA CLP SOW[6]			1		5		
1,1,1-Trichoroethane	EPA CLP SOW[6]			10		10		
Carbon Tetrachloride	EPA CLP SOW[6]			5		5		
Vinyl Acetate	EPA CLP SOW[6]			5		5		
Bromodichloromethane	EPA CLP SOW[6]			10		10		
1,2-Dichloropropane	EPA CLP SOW[6]			5		5		
cis-1,3-Dichloropropene	EPA CLP SOW[6]			5		5		
Trichloroethene	EPA CLP SOW[6]			5		5		
Dibromochloromethane	EPA CLP SOW[6]			5		5		
1,1,2-Trichloroethane	EPA CLP SOW[6]			5		5		
Benzene	EPA CLP SOW[6]			5		5		
trans-1,2-Dichloropropene	EPA CLP SOW[6]			5		5		
Bromoform	EPA CLP SOW[6]			5		5		
4-Methyl-2-pentanone	EPA CLP SOW[6]			5		5		
2-Hexanone	EPA CLP SOW[6]			5		5		
Tetrachloroethene	EPA CLP SOW[6]			10		10		
Toluene	EPA CLP SOW[6]			10		10		
1,1,2,2-Tetrachoroethane	EPA CLP SOW[6]			5		5		
Chlorobenzene	EPA CLP SOW[6]			5	ug/L	5 ug/KG	**	***
Ethyl Benzene	EPA CLP SOW[6]			5		5		
Styrene	EPA CLP SOW[6]			5		5		
Total Xylenes	EPA CLP SOW[6]			5		5		
	EPA CLP SOW[6]			5		5		
Target Compound List - Semi-Volatiles			X					
Phenol	EPA CLP SOW[6]						SOIL	SOIL
bis(2-Chloroethyl)ether	EPA CLP SOW[6]					330 ug/Kg[3]	**	***
2-Chlorophenol	EPA CLP SOW[6]					330		
1,3-Dichlorobenzene	EPA CLP SOW[6]					330		
1,4-Dichlorobenzene	EPA CLP SOW[6]					330		
Benzyl Alcohol	EPA CLP SOW[6]					330		
1,2-Dichlorobenzene	EPA CLP SOW[6]					330		
						330		

TABLE A-1 (CONTINUED)

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

2-Methylphenol	EPA CLP SOW*		330			
bis(2-Chloroisopropyl)ether	EPA CLP SOW*		330			
4-Methylphenol	EPA CLP SOW*		330			
N-Nitroso-Dipropylamine	EPA CLP SOW*		330			
Hexachloroethane	EPA CLP SOW*		330			
Nitrobenzene	EPA CLP SOW*		330			
Isophorone	EPA CLP SOW*		330			
2-Nitrophenol	EPA CLP SOW*		330			
2,4-Dimethylphenol	EPA CLP SOW*		330			
Benzoic Acid	EPA CLP SOW*		1600			
bis(2-Chloroethoxy)methane	EPA CLP SOW*		330			
2,4-Dichlorophenol	EPA CLP SOW*		330			
1,2,4-Trichlorobenzene	EPA CLP SOW*		330			
Naphthalene	EPA CLP SOW*		330			
4-Chloroanaline	EPA CLP SOW*		330			
Hexachlorobutadiene	EPA CLP SOW*		330			
4-Chloro-3-methylphenol	EPA CLP SOW*		330			
2-Methylnaphthalene	EPA CLP SOW*		330			
Hexachlorocyclopentadiene	EPA CLP SOW*		330			
2,4,6-Trichlorophenol	EPA CLP SOW*		330			
2,4,5-Trichlorophenol	EPA CLP SOW*		1600	ug/Kg'	**	***
2-Chloronaphthalene	EPA CLP SOW*		330			
2-Nitroanaline	EPA CLP SOW*		1600			
Dimethylphthalate	EPA CLP SOW*		330			
Acenaphthylene	EPA CLP SOW*		330			
2,6-Dinitrotoluene	EPA CLP SOW*		330			
3-Nitroaniline	EPA CLP SOW*		1600			
Acenaphthene	EPA CLP SOW*		330			
2,4-Dinitrophenol	EPA CLP SOW*		1600			
4-Nitrophenol	EPA CLP SOW*		1600			
Dibenzofuran	EPA CLP SOW*		330			
2,4-Dinitrotoluene	EPA CLP SOW*		330			
Diethylphthalate	EPA CLP SOW*		330			
4-Chlorophenol Phenyl ether	EPA CLP SOW*		330			
Fluorene	EPA CLP SOW*		330			
Target Compound List - Semi-Volatiles (continued)		x				
4-Nitroanaline	EPA CLP SOW*		1600	ug/Kg'	**	***
4,6-Dinitro-2-methylphenol	EPA CLP SOW*		1600			
N-nitrosodiphenylamine	EPA CLP SOW*		330			
4-Bromophenyl Phenyl ether	EPA CLP SOW*		330			
Hexachlorobenzene	EPA CLP SOW*		330			
Pentachlorophenol	EPA CLP SOW*		1600			
Phenanthrene	EPA CLP SOW*		330			
Anthracene	EPA CLP SOW*		330			
Di-n-butylphthalate	EPA CLP SOW*		330			
Fluoranthene	EPA CLP SOW*		330			
Pyrene	EPA CLP SOW*		330			
Butyl Benzylphthalate	EPA CLP SOW*		330			
3,3'-Dichlorobenzidine	EPA CLP SOW*		660			
Benzo(a)anthracene	EPA CLP SOW*		330			
Chrysene	EPA CLP SOW*		330			
bis(2-ethylhexyl)phthalate	EPA CLP SOW*		330			

TABLE A-1 (CONTINUED)

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

Di-n-octyl Phthalate	EPA CLP SOW*			330		
Benzo(b)fluoranthene	EPA CLP SOW*			330		
Benzo(k)fluoranthene	EPA CLP SOW*			330		
Benzo(a)pyrene	EPA CLP SOW*			330		
Indeno(1,2,3-cd)pyrene	EPA CLP SOW*			330		
Dibenz(a,h)anthracene	EPA CLP SOW*			330		
Benzo(g,h,i)perylene	EPA CLP SOW*			330		
RADIONUCLIDES						
					(Replicate Analyses) **	(Laboratory Control Sample) ***
Gross Alpha	a,f,g,h,i,k,l,m,n	X	NA	4 pCi/g		
Gross Beta	a,f,g,h,i,k,l,m,n	X	NA	10 pCi/g		
Uranium 233+234	f,h,i,m,n,s,l X'	X	0.6 pCi/L	0.3 pCi/g		
Uranium 235,238	f,h,i,m,n,s,l	X	NA	0.3 pCi/g		
Americium 241	p,q,s,l,i	X	NA	0.02 pCi/g		
Plutonium 239+240	o,p,s,l,i X'	X	0.01 pCi/L	0.03 pCi/g		
Tritium	f,g,h,m,s,i,l X"	X	400 pCi/L	400 pCi/L		
Strontium 89,90	f,h,i,m,s,l	X	NA	1 pCi/g		
FIELD MEASUREMENTS						
1,1,1 Trichloroethane	EPA 502.2	X	5 ug/L	35% RPD		
Carbon tetrachloride	EPA 502.2	X	5 ug/L	35% RPD		
Methylethylketone	EPA 502.2	X	10 ug/L	35% RPD		
Dichloromethane	EPA 502.2	X	5 ug/L	35% RPD		
Perchloroethane	EPA 502.2	X	5 ug/L	35% RPD		
Trichloroethene	EPA 502.2	X	5 ug/L	35% RPD		
Benzene	EPA 502.2	X	5 ug/L			
Toluene	EPA 502.2	X	5 ug/L			
Xylene	EPA 502.2	X	5 ug/L			

TABLE A-1 (CONTINUED)

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

FIELD PARAMETERS				Detection Limit	Precision	Accuracy
pH	1	X		± 0.1 pH unit	NA	± 0.2 pH units
Specific Conductance	1	X		2.5 umho/cm³ 25 umho/cm³ 250 umho/cm³	NA NA NA	± 2.5% max. error at 500, 5000, 50000 umhos/cm plus probe; ± 3.0% max error at 250, 2500, and 25000 plus probe accuracy of ± 2.0%.
Temperature	1	X		± 0.1°C	NA	± 1.0°C
Beta/Gamma	Geiger Muller Detector		X	5,000 dpm/100cm³	± 20% Error	NA
Alpha Radiation	FIDLER		X	300 dpm/100cm³	± 20% Error	NA

TABLE A-1 (CONTINUED)

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

** Precision objective = control limits specified in referenced method and/or Data Validation Guidelines.
*** Accuracy objective = control limits specified in referenced method (in GRRASP for radionuclides).
F = Filtered
U = Unfiltered

1. Measured in the field in accordance with instrument manufacturer's instructions. The instruments to be used are specified in Section 12.
2. Medium soil/sediment required detection limits for pesticide/PCB TCL compounds are 15 times the individual low soil/sediment required detection limit.
3. Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.
4. Higher detection limits may only be used in the following circumstance: If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the required detection limit. This is illustrated in the example below:

   For lead:

   Method in use - ICP
   Instrument Detection Limit (IDL) - 40
   Sample Concentration - 220
   Required Detection Limit (RDL) - 3

   The value of 220 may be reported even though the instrument detection limit is greater than the RDL.

   Note: The specified detection limits are based on a pure water matrix. The detection limits for samples may be considerably higher depending on the sample matrix.
5. If gross alpha > 5 pCi/L, analyze for Radium 226; if Radium 226 > 3 pCi/L, analyze for Radium 228.
6. The detection limits presented were calculated using the formula in N.R.C. Regulatory Guide 4.14, Appendix Lower Limit of Detection, pg. 21, and follow:

$$LLD = \frac{4.66\ (BKG/BKG\ DUR)^{1/2}}{(2.22)(Eff)(CR)(SR)(e^{-\lambda t})(Aliq)}$$

$$MDA = \frac{4.66\ (BKG/Sample\ DUR)^{1/2}}{(2.22)(Eff)(CR)(SR)e^{-\lambda t}(Aliq)}$$

Where:

LLD = Lower Limit of Detection in pCi per sample unit.

BKG = Instrument Background in counts per minute (CPM).
Eff = Counting efficiency in cpm/disintegration per minute (dpm).
CR = Fractional radiochemical yield.
SR = Fractional radiochemical yield of a known solution.
λ = The radioactive decay constant for the particular radionuclide.
t = The elapsed time between sample collection and counting
Aliq = Sample volume.
BKG DUR = Background count duration in minutes.

MDA = Minimum Detectable Activity in pCi per sample unit
BKG = same as for LLD
EFF = same as for LLD
CR = same as for LLD
SR = same as for LLD
λ = same as for LLD
t = same as for LLD
Aliq = same as for LLD
Sample DUR = sample count duration in minutes

7. On 500 umho/cm range.
8. On 5000 umho/cm range.
9. On 50000 umho/cm range.

a. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version).
b. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version). The specific method to be utilized is at the laboratory's discretion provided it meets the specified detection limit.
c. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, 2/88 (or latest version).
d. Methods are from "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, 1983, unless otherwise indicated.
e. Methods are from "Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods," (SW-846, 3rd Ed.), U.S. Environmental Protection Agency.

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TABLE A-1 (CONTINUED)

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 8

f. U.S. Environmental Protection Agency, 1979, Radiochemical Analytical Procedures for Analysis of Environmental Samples, Report No. EMSL-LY-0539-1, Las Vegas, NV, U.S. Environmental Protection Agency.
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i. Harley, J.H., ed., 1975, ASL Procedures Manual, HASL-300; Washington, D.C., U.S. Energy Research and Development Administration.
j. U.S. EPA, 1982. "Methods for Organic Analysis of Municipal and Industrial Waste Water," US EPA-600/4-82-057.
k. "Handbook of Analytical Procedures," USAEC, Grand Junction Lab. 1970, page 196.
l. "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, August 1980, Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.
m. "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," U.S.G.S. Book 5, Chapter A5, 1977.
n. "Acid Dissolution Method for the Analysis of Plutonium in Soil," EPA-600/7-79-081, March 1979, U.S. EPA Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 1979.
o. "Procedures for the Isolation of Alpha Spectrometrically Pure Plutonium, Uranium, and Americium," by E.H. Essington and B.J. Drennon, Los Alamos National Laboratory, a private communication.
p. "Isolation of Americium from Urine Samples," Rocky Flats Plant, Health, Safety, and Environmental Laboratories.
q. "Radioactivity in Drinking Water," EPA 570/9-81-002.
r. If the sample or duplicate result is <5 x IDL, then the control limit is ± IDL.
s. U.S. EPA, 1987. "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual," EPA-520/5-84-006.

TABLE A-2

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 9

OBJECTIVE (DATA NEED)	DATA TYPE	SAMPLING/ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
CHARACTERIZE SITE PHYSICAL FEATURES AND HISTORICAL OPERATIONS				
Historical release information, waste stream characterization, as-built information, and operational information	Release reports, waste stream analyses, personnel interviews, engineering drawings	Compile and review additional data	N/A	Focus field investigation activities Focus sample analytical parameters

TABLE A-2 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 9

OBJECTIVE (DATA NEED)	DATA TYPE	SAMPLING/ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
CHARACTERIZE NATURE OF CONTAMINATION IN SOURCES				
Identify pipeline release locations	Data from surface radiation surveys	Perform surface radiation surveys at locations where surface soils were impacted by pipeline releases	II	Site Characterization Baseline Risk Assessment Environmental Evaluation Evaluation of Remedial Alternatives
	Field observation of pipelines and surrounding soil	Observe pipeline condition in test pits excavated at documented release locations, structural features, and/or locations based on observations from previous test pits and pipeline release conceptual model	N/A	
	Data from pipeline pressure testing	Perform pressure testing of pipeline sections between test pits	II	
Identify and characterize contaminant sources in OPWL pipelines	Data from radiation screening of pipelines	Measure dose rates inside pipeline openings in test pits using field radiological instruments	I	
	Data from residue and wipe samples	Collect residue samples from pipelines in test pits; analyze for TAL Metals, TOC, TCL Volatiles, TCL Semivolatiles, Radionuclides, Anions, pH, and specific conductance	IV (V for radionuclides)	
		Collect wipe samples from pipelines with no residue; analyze for qualitative radionuclides	II	

TABLE A-2 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 9

OBJECTIVE (DATA NEED)	DATA TYPE	SAMPLING/ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
Identify tank release locations	Data from surface radiation surveys	Perform surface radiation surveys at locations where surface soils were impacted by tank releases	II	Site Characterization Baseline Risk Assessment Environmental Evaluation Evaluation of Remedial Alternatives
	Field observation of tanks	Observe condition of tank interiors through tank openings	N/A	
Identify and characterize contaminant sources in OPWL tanks	Data from radiation screening of tanks	Measure does rates inside tanks using field radiological instruments	I	
	Data from residue and wipe samples	Collect residue samples from tanks; analyze for TAL Metals, TOC, TCL Volatiles, TCL Semivolatiles, Radionuclides, Anions, pH, and specific conductance	IV (V for radionuclides)	
		Collect wipe samples from tanks with no residue; analyze for qualitative radionuclides	II	

TABLE A-2 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 9

OBJECTIVE (DATA NEED)	DATA TYPE	SAMPLING/ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
CHARACTERIZE NATURE AND EXTENT OF CONTAMINATION IN SOILS				
Characterize soil contamination at pipeline release sites	Data from soil samples	Stage 1 - Collect samples of surface soil, trench backfill, and native soil from test pits; analyze for TAL Metals, TOC, TCL Volatiles, TCL Semivolatiles, Radionuclides, Anions, pH, and specific conductance	IV (V for radionuclides)	Site Characterization Baseline Risk Assessment Environmental Evaluation Evaluation of Remedial Alternatives
Characterize soil contamination along pipeline alignments	Data from soil samples	Stage 2 - Collect samples of surface soil, trench backfill, and native soil from soil borings located along pipeline alignments around contaminated test pits; analyze for analytes of concern identified by results of Stage 1 sampling		

TABLE A-2 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 9

OBJECTIVE (DATA NEED)	DATA TYPE	SAMPLING/ANALYSIS ACTIVITY	ANALYTICAL LEVEL	DATA USE
Assess extent of soil contamination at pipeline release locations	Data from soil samples	Stage 3 - Collect samples of surface soil, trench backfill, and native soil from soil borings located within and surrounding contaminated areas identified through Stage 1 and Stage 2 sampling; analyze for analytes of concern identified by results of Stage 1 and Stage 2 sampling	IV (V for radionuclides)	Site Characterization Baseline Risk Assessment Environmental Evaluation Evaluation of Remedial Alternatives
Characterize soil contamination around OPWL tanks	Data from soil samples	Stage 1 - Collect samples of surface and subsurface soil from soil boring placed on each accessible side of tank; analyze for TAL Metals, TOC, TCL Volatiles, TCL Semivolatiles, Radionuclides, Anions, pH, and specific conductance		
Assess extent of soil contamination around OPWL tanks	Data from soil samples	Stage 2 - Collect samples of surface and subsurface soils from soil borings placed around contaminated tank locations; analyze for analytes of concern identified by results of Stage 1 sampling		

TABLE A-3

PHASE I RFI/RI, ANALYTICAL DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 10

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Determine site-specific transport characteristics of the vadose zone materials	Soil physical parameters	Drill borings and collect samples for moisture content, sieve analysis, determination of porosity, permeameter tests, and analysis of total organic carbon content	I	• Source/Soil Characterization • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Characterize subsurface stratigraphy and depth to groundwater	Geologic description	Drill borings and log subsurface geology	I	• Source/Soil Characterization • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Characterize groundwater flow regime around each Individual Hazardous Substance Site (IHSS)	Water level data	• Obtain quarterly water level measurements form existing monitoring wells and new piezometers around each IHSS	I I	• Source/Soil Characterization • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Characterize movement of water in the vadose zone	Soil moisture levels Matric potential measurements	Install tensiometers or equivalent at selected IHSSs	I	• Source/Soil Characterization • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Characterize tank integrity	Visual inspection and response to pressurization	• Make and record visual observations of interior and exterior • Pressurize tank to detect leaks	I	• Source Characterization

TABLE A-3 (CONTINUED)

PHASE I RFI/RI, ANALYTICAL DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 10

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Characterize tank residues	Residue chemical data	Collect liquid or sludge samples for chemical analysis	IV (V for radiological analysis)	• Source Characterization
Characterize presence/absence and nature/extent of contaminant release from underground storage tanks	Test pits and soil sampling	Dig test pits and collect soil samples near valves, pipe joints, and elbows, and where leaks are indicated from tank integrity testing	IV	• Source/Soil Characterization
Characterize source and presence/absence and nature/extent of soil contamination at each IHSS	Soil and source chemical data	• Conduct radiological (HPGe) surveys	II	• Source/Soil Characterization
		• Conduct soil gas surveys at appropriate IHSSs; analyze vapor samples for volatile organic compounds (VOCs)	II	• Baseline Risk Assessment
				• Environmental Evaluation
		• Collect surficial soil samples; analyze for parameters appropriate for each IHSS	IV (V for radiological analysis)	• Evaluation of Remedial Alternatives
		• Collect soil core samples for depth profiles at soil gas or radiation hot spots or near tanks or other release points; analyze for parameters appropriate for each IHSS	IV (V for radiological analysis)	• Source/Soil Characterization
Characterize presence or absence of surface water contamination	Surface water sample data	Collect surface water samples	IV (V for radiological analysis)	• Surface Water Characaterization
				• Phase II Planning
Characterize presence or absence of sediment contamination at appropriate IHSSs	Sediment chemical data	Collect sediment samples from drainages downgradient of selected IHSSs	IV (V for radiological analysis)	• Source/Soil Characterization
				• Phase II Planning
Characterize presence or absence of groundwater contamination	Groundwater grab sample data	Collect grab samples from water table during drilling of soil borings	IV (V for radiological analysis)	• Groundwater Characterization
				• Phase II Planning

TABLE A-4

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 12

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
CHARACTERIZENATURE AND EXTENT OF CONTAMINATION				
Define the nature and horizontal extent of surficial soil contamination				
Characterize surficial soils	Radiation survey data	• Perform field radiation survey at IHSSs	I, II, or III	• Characterize Nature and Extent
	Surficial soil contamination data	• Collect surficial soil samples at IHSSs; analyze for parameters appropriate for each IHSS	IV (V for radiological analyses)	• Baseline Risk Assessment • Evaluation of Remedial Alternatives
Define the nature and vertical extent of contamination in the soil column beneath each IHSS				
Characterize presence or absence of soil contamination at each IHSS	Soil chemical data	• Conduct soil gas surveys at appropriate IHSSs; analyze vapor samples for volatile organic compounds	II or III	• Characterize Nature and Extent
		• Collect subsurface soil and ground water samples at IHSSs for real time analysis	II	• Baseline Risk Assessment • Evaluation of Remedial Alternatives
		• Drill borings and collect subsurface soil core samples, analyze for nonradionuclides and radionuclides at appropriate IHSSs	IV (V for radiological analysis)	

TABLE A-4 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 12

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Characterize subsurface stratigraphy and depth to ground water	Geologic parameters	• Drill borings and log subsurface geology	I	• Characterize Nature and Extent • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Determine the extent of sediment contamination	Sediment chemical data	• Collect sediment samples at select IHSSs	IV (V for radiological analysis)	• Characterize Nature and Extent • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Determine if ground water beneath IHSSs has been affected by contamination in the overlying soils				
Characterize movement of water in the unsaturated zone	Soil moisture data Leachability values	• Install tensiometers at selected IHSS • Collect ground water screening samples at select IHSSs for real time analysis	I II	• Characterize Nature and Extent • Baseline Risk Assessment • Evaluation of Remedial Alternatives

TABLE A-4 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 12

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Determine the extent of ground water contamination				
Characterize potential of ground water contamination at appropriate IHSS	Ground water chemical data	• Collect ground water samples from monitoring wells at selected IHSS	IV (V for radiological analysis)	• Characterize Nature and Extent • Baseline Risk Assessment • Evaluation of Remedial Alternatives
Assess the ground water migration potential beyond the IHSS and OU12 boundaries				
Characterize local ground water flow regime at appropriate IHSSs	Water level data	• Obtain water level measurements from well points installed at IHSSs • Install monitoring wells at IHSSs where wells are required • Conduct slug tests on wells installed at IHSSs	I I	• Characterize Nature and Extent • Baseline Risk Assessment • Evaluation of Remedial Alternative

TABLE A-4 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 12

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
DETERMINE RISKS ASSOCIATED WITH CONTAMINATION				
Contamination identification	Analytical data	• See description for Nature and Extent of Contamination	I, III, IV (V for radiological analysis)	• Baseline Risk Assessment
Exposure assessment	All data that characterize nature and extent	• See description for Nature and Extent of Contamination	I, III, IV (V for radiological analysis)	• Determine potential pathways and receptors
Toxicity assessment	Analytical data Toxicity values	• See description for Nature and Extent of Contamination	I, III, IV (V for radiological analysis)	• Determine risk to receptors
Risk characterization	Toxicity values Exposure assessment	• Not applicable	Not applicable	• Baseline Risk Assessment • Evaluation of Remedial Alternatives
Uncertainty analysis	Statistical parameters	• Not applicable	Not applicable	• Determine adequateness of data to perform Baseline Risk Assessment

TABLE A-4 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 12

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
SUPPORT SELECTION OF REMEDIAL ACTION ALTERNATIVES				
Nature and extent of contamination	Analytical data Volume of contaminated material	• See descriptions above for Characterizing Nature and Extent of Contamination		• Evaluation of Remedial Alternatives
Treatability studies	Bench-scale testing	• Collect samples pre- and post-treatment to determine effectiveness of alternative	IV (V for radiological analytes)	
Characterize site-specific geologic parameters	Soil physical parameters	• Collect soil samples for parameters identified as appropriate for each IHSS	I, II	• Evaluation of Remedial Alternatives

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TABLE A-5

PHASE I RFI/RI ANALYTICAL DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 13

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Establish the presence or absence of contaminants	Soil gas, HPGe, soil and groundwater data	For each IHSS, conduct HPGe radiation survey, soil gas survey, collect surface soil samples, subsurface soil samples, and groundwater samples, and asphalt samples, as necessary	II for HPGe radiation survey, IV for conventional analytes, & V for radiological analytes	• Contaminant source and multi-media characterization
Characterize the environmental setting of each IHSS				
Subsurface stratigraphy and characteristics of subsurface materials	Geologic description	Evaluate applicability of existing data from adjoining IHSS's, drill boreholes and log subsurface materials	I	• Soil and Subsurface Characterization
Depth to groundwater	Water level data	Water level data from existing wells, piezometers and newly installed boreholes	I	• Subsurface Characterization
Groundwater flow regime	Water level data and aquifer tests	Evaluate applicability of newly developed aquifer data from adjoining Operable Units	I	• Aquifer Characterization
Vadose water flow regime	Soil moisture data and matric potential measurements	Evaluate applicability of newly developed vadose zone data from STP vadose characterization and the OU2 vadose study	I	• Vadose Zone Characterization
Characterize the nature and extent of contamination				
Affected media including location, concentration, type, physical state, and quantity of contaminants	Surface water, soil and groundwater data	For each IHSS, conduct HPGe radiation survey, soil gas survey, collect surface soil samples, subsurface soil samples, and groundwater samples, and asphalt samples, as necessary	IV for conventional analytes and V for radiological analytes	• Site Characterization • Evaluation of Remedial Alternatives • Risk Assessment

TABLE A-5 (CONTINUED)

PHASE I RFI/RI ANALYTICAL DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 13

Specific Objective (Data Need)	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Assess fate and transport of contaminants	Soil and aquifer physical parameters	Evaluate applicability of newly developed aquifer data from adjoining Operable Units and vadose zone data from STP vadose characterization and the OU2 vadose study	I	• Risk Assessment
Assess risk to human health and environment	Data types indicated above	Synthesis of RFI/RI data	I	• Risk Assessment
Identify applicable remedial measures	Data types indicated above	Synthesis of RFI/RI data	I	• Evaluation of Remedial Alternatives

TABLE A-6

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 14

Activities Supporting RFI/RI Objectives and Specific Data Needs	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Delineation of the Areal Extent and Location of Each IHSS				
Define the horizontal nature and extent of surficial soil contamination				
• Characterize surficial soils	Radiation survey data	Perform field radiation survey at each IHSS	III	Source/Soil Characterization
	Surficial soil contamination data	Collect and analyze surficial soil samples at each IHSS; analyze for parameters appropriate for each IHSS	IV (V for radiological analyses)	Baseline Risk Assessment Environmental Evaluation
	Surficial soil physical properties data	Collect and analyze surficial soil samples for physical characteristics	I, II	Evaluation of Remedial Alternatives
Define the vertical nature and extent of contamination in the soil column beneath each IHSS and potential for contaminated soil to impact surface water and groundwater				
• Characterize presence or absence of subsurface utilities/structures	Geophysical data/ Existing utilities maps	Conduct borehole clearance geophysical survey at appropriate IHSSs that will have subsurface investigations	I	Source/Soil Characterization

TABLE A-6 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 14

Activities Supporting RFI/RI Objectives and Specific Data Needs	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
• Characterize presence or absence of soil contamination at each IHSS	Soil chemical and physical properties data	Conduct soil gas surveys at appropriate IHSSs; analyze vapor samples for volatile organic compounds (VOC)	III	Source/Soil, Surface Water, Groundwater Characterization
		Collect and analyze *in situ* soil and subsurface soil samples at all IHSSs	III	Baseline Risk Assessment
		Collect soil and analyze core samples along depth profiles, analyze for parameters appropriate for each IHSS	IV (V for radiological analysis)	Environmental Evaluation Evaluation of Remedial Alternatives
		Collect soil samples for analysis of physical properties	I, II	
• Characterize subsurface stratigraphy and depth to groundwater	Geologic parameters	Drill borings and log subsurface geology	I	Source/Soil, Groundwater Characterization Baseline Risk Assessment Evaluation of Remedial Alternatives

TABLE A-6 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 14

Activities Supporting RFI/RI Objectives and Specific Data Needs	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Determine if groundwater beneath IHSS has been affected by contamination in the subsurface soil				
• Characterize presence or absence of groundwater contamination at appropriate IHSS	Groundwater chemical data	Collect and analyze groundwater samples from monitoring wells at selected IHSS	IV (V for radiological analysis)	Soil Groundwater Characterization Baseline Risk Assessment Environmental Evaluation Evaluation of Remedial Alternatives
Assess the groundwater migration potential beyond the IHSS and OU14 boundaries				
• Characterize groundwater flow regime around appropriate IHSSs	Water level data	Obtain quarterly water level measurements from existing monitoring wells around each IHSS	I	Groundwater Characterization
		Install monitoring wells at each IHSS as appropriate and conduct pumping test	I	Baseline Risk Assessment Evaluation of Remedial Alternative

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TABLE A-6 (CONTINUED)

PHASE I RFI/RI DATA QUALITY OBJECTIVES AT OPERABLE UNIT NO. 14

Activities Supporting RFI/RI Objectives and Specific Data Needs	Data Type	Sampling/Analysis Activity	Analytical Level	Data Use
Support Section of Remedial Action Alternative • Treatability studies	Bench-scale testing	Collect and analyze pretreatment samples to determine effectiveness of alternative	IV (V for radiological analytes)	
• Characterize site-specific geologic parameters	Soil physical parameters	Collect and analyze soil samples for parameters identified as appropriate for each IHSS	I, II	Evaluation of Remedial Alternatives

APPENDIX B

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
INDICATORS									
Total Suspended Solids	EPA 160.2*	X				10 mg/L	NA	20%RPD	80-120% LCS Recovery
Total Dissolved Solids	EPA 160.1*	X	X					20%RPD	80-120% LCS Recovery
pH	EPA 160.1*	X	X			0.1 pH units	0.1 pH units	NA	10.05 pH units
INORGANICS									
Target Analyte - Metals		X	X	X	X			WATER/SOIL	WATER/SOIL
Aluminum	EPA CLP SOW*					200 µg/L	40 mg/Kg		
Antimony	EPA CLP SOW*					60	12		
Arsenic (GFAA)	EPA CLP SOW*					10	2		
Barium	EPA CLP SOW*					200	40		
Beryllium	EPA CLP SOW*					5	1.0		
Cadmium	EPA CLP SOW*					5	1.0		
Calcium	EPA CLP SOW*					5000	2000		
Chromium	EPA CLP SOW*					10	2.0		
Cobalt	EPA CLP SOW*					50	10		
Copper	EPA CLP SOW*					25	5.0		
Cyanide	EPA 335.3*(mod. for CLP)					5	10		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Target Analyte - Metals (Cont.)		X	X	X	X			WATER/SOIL	WATER/SOIL
Iron	EPA CLP SOW°					100 µg/L	20 mg/Kg		
Lead (GFAA)	EPA CLP SOW°					3	1.0		
Magnesium	EPA CLP SOW°					5000	2000		
Manganese	EPA CLP SOW°					15	3.0		
Mercury (GFAA)	EPA CLP SOW°					0.2	0.2		
Nickel	EPA CLP SOW°					40	8.0		
Potassium	EPA CLP SOW°					5000	2000		
Selenium (GFAA)	EPA CLP SOW°					5	1.0		
Silver	EPA CLP SOW°					10	2.0		
Sodium	EPA CLP SOW°					5000	2000		
Thallium (GFAA)	EPA CLP SOW°					10	2.0		
Vanadium	EPA CLP SOW°					50	10		
Zinc	EPA CLP SOW°					20	4.0		
Other Metals		X	X	X	X			WATER/SOIL	WATER/SOIL
Molybdenum	EPA CLP SOW° (ICAP)					8 µg/L	40 mg/Kg	••	•••
Cesium	EPA CLP SOW°					1000	200		
Strontium	EPA CLP SOW°					200	40		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Other Metals (Cont.)		X	X	X	X			WATER/SOIL	WATER/SOIL
Lithium	EPA CLP SOW*					100	20		
Tin	EPA CLP SOW*					200	40		
Other Inorganics									
Percent solids	EPA 160.3*			X	X	NA	10 mg	NA	NA
Sulfide	EPA 376.1*			X	X	NA	4 µg/g	Same as metals	Same as metals
ANIONS								Water/Soil	Water/Soil
Carbonate	EPA 310.1*	X	X			10 mg/L	NA	Same as metals	Same as metals
Bicarbonate	EPA 310.1*	X	X			10 mg/L	NA		
Chloride	EPA 325.2*	X	X			5 mg/L	NA		
Sulfate	EPA 375.4*	X	X			5 mg/L	NA		
Nitrate as N	EPA 353.2* or 353.3*	X	X			1 mg/L	NA		
Fluoride	EPA CLP S*	X	X			5 mg/L	NA		
Oil and Grease	EPA CLP S*	X				5 mg/L	NA		
*Total Petroleum Hydrocarbons	EPA 418.1*			X	X	NA	10 mg/Kg	NA/40	NA/80-120

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Target Compound List-Volatiles	EPA CLP SOW°	X	X	X	X			WATER/SOIL	WATER/SOIL
Cloromethane	EPA CLP SOW°					10 µg/L	10 µg/Kg (low)	••	•••
Bromomethane	EPA CLP SOW°					10	10		
Vinyl Chloride	EPA CLP SOW°					10	10		
Cloroethane	EPA CLP SOW°					10	10		
Methylene Chloride	EPA CLP SOW°					5	5		
Acetone	EPA CLP SOW°					10	10		
Carbon Disulfide	EPA CLP SOW°					5	5		
1,1-Dichloroethene	EPA CLP SOW°					5 µg/L	5 µg/L		
1,1-Dichloroethane	EPA CLP SOW°					5	5		
total 1,2-Dichloroethene	EPA CLP SOW°					5	5		
Chloroform	EPA CLP SOW°					5	5		
1,2-Dichloroethane	EPA CLP SOW°					1	5		
2-Butatone	EPA CLP SOW°					10	10		
1,1,1-Trichoroethane	EPA CLP SOW°					5	5		
Carbon Tetrachloride	EPA CLP SOW°					5	5		
Vinyl Acetate	EPA CLP SOW°					10	10		
Bromodichloromethane	EPA CLP SOW°					5	5		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Target Compound List-Volatiles (Cont.)	EPA CLP SOW°	X	X	X	X			WATER/SOIL	WATER/SOIL
1,2-Dichloropropane	EPA CLP SOW°					5	5		
cis-1,3-Dichloropropene	EPA CLP SOW°					5	5		
Trichloroethene	EPA CLP SOW°					5	5		
Dibromochloromethane	EPA CLP SOW°					5	5		
1,1,2-Trichloroethane	EPA CLP SOW°					5	5		
Benzene	EPA CLP SOW°					5	5		
trans-1,2-Dichloropropene	EPA CLP SOW°					5	5		
Bromoform	EPA CLP SOW°					5	5		
4-Methyl-2-pentatone	EPA CLP SOW°					10	10		
2-Hexanone	EPA CLP SOW°					10	10		
Tetrachloroethene	EPA CLP SOW°					5 µg/L	5 µg/Kg		
Toluene	EPA CLP SOW°					5	5		
1,1,2,2-Tetrachoroethane	EPA CLP SOW°					5	5		
Chlorobenzene	EPA CLP SOW°					5	5		
Ethyl Benzene	EPA CLP SOW°					5	5		
Styrene	EPA CLP SOW°					5	5		
Total Xylenes	EPA CLP SOW°					5	5		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Target Compound List-Semi-Volatiles			X	X	X			WATER/SOIL	WATER/SOIL
Phenol	EPA CLP SOW°					10 µg/L	330 µg/Kg		
bis(2-Chloroethyl)ether	EPA CLP SOW°					10	330		
2-Chlorophenol	EPA CLP SOW°					10	330		
1,3-Dichlorobenzene	EPA CLP SOW°					10	330		
1,4-Dichlorobenzene	EPA CLP SOW°					10	330		
Benzyl Alcohol	EPA CLP SOW°					10	330		
1,2-Dichlorobenzene	EPA CLP SOW°					10	330		
2-Methylphenol	EPA CLP SOW°					10	330		
bis(2-Chloroisopropyl)ether	EPA CLP SOW°					10	330		
4-Methylphenol	EPA CLP SOW°					10	330		
N-Nitroso-Dipropylamine	EPA CLP SOW°					10	330		
Hexachloroethane	EPA CLP SOW°					10	330		
Nitrobenzene	EPA CLP SOW°					10 µg/L	330 µg/Kg		
Isophorone	EPA CLP SOW°					10	330		
2-Nitrophenol	EPA CLP SOW°					10	330		
2,3-Dimethylphenol	EPA CLP SOW°					10	330		
Benzoic Acid	EPA CLP SOW°					50	1600		

1/29/00

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Target Compound List-Volatiles (Cont.)	EPA CLP SOW*	X	X	X	X			WATER/SOIL	WATER/SOIL
bis(2-Choroethoxy)methane	EPA CLP SOW*					10	330		
2,4-Dichlorophenol	EPA CLP SOW*					10	330		
1,2,4-Trichlorobenzene	EPA CLP SOW*					10	330		
Naphthalene	EPA CLP SOW*					10	330		
4-Chloroanaline	EPA CLP SOW*					10	330		
Hexachlorobutadiene	EPA CLP SOW*					10	330		
4-Chloro-3-methylphenol	EPA CLP SOW*					10	330		
2-Methylnaphthalene	EPA CLP SOW*					10	330		
Hexachlorocyclopentadiene	EPA CLP SOW*					10 µg/L	330 µg/Kg		
2,4,6-Trichlorophenol	EPA CLP SOW*					10	330		
2,4,5-Trichlorophenol	EPA CLP SOW*					50	1600		
2-Chloronaphthalene	EPA CLP SOW*					10	330		
2-Nitroanaline	EPA CLP SOW*					50	1600		
Dimethylphthalate	EPA CLP SOW*					10	330		
Acenaphthene	EPA CLP SOW*					10	330		
2,6-Dinitrotoluene	EPA CLP SOW*					10 µg/L	330 µg/Kg		

10/21/93

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
3-Nitroaniline	EPA CLP SOW°					50	1600		
Target Compound List-Volatiles (Cont.)	EPA CLP SOW°	X	X	X	X			WATER/SOIL	WATER/SOIL
Acenaphthene	EPA CLP SOW°					10	330		
2,4-Dinitrophenol	EPA CLP SOW°					50	1600		
4-Nitrophenol	EPA CLP SOW°					50	1600		
Dibenzofuran	EPA CLP SOW°					10	330		
2,4-Dinitrotoluene	EPA CLP SOW°					10	330		
Diethylphthalate	EPA CLP SOW°					10	330		
4-Chlorophenol Phenyl ether	EPA CLP SOW°					10	330		
Fluorene	EPA CLP SOW°					10	330		
4-Nitroanaline	EPA CLP SOW°					50	1600		
4,6-Dinitro-2-methylphenol	EPA CLP SOW°					50	1600		
N-nitrosodiphenylamine	EPA CLP SOW°					10	330		
4-Bromophenyl Phenyl ether	EPA CLP SOW°					10	330		
Hexachlorobenzene	EPA CLP SOW°					10	330		
Pentachlorophenol	EPA CLP SOW°					50	1600		
Phenanthrene	EPA CLP SOW°					10	330		
Anthracene	EPA CLP SOW°					10	330		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Di-n-butylphthalate	EPA CLP SOW°					10 µg/L	330 µg/Kg		
Target Compound List-Volatiles (Cont.)	EPA CLP SOW°	X	X	X	X			WATER/SOIL	WATER/SOIL
Fluoranthene	EPA CLP SOW°					10 µg/L	330 µg/Kg		
Pyrene	EPA CLP SOW°					10	330		
Butyl Benzlphthalate	EPA CLP SOW°					10	330		
3,3'-Dichlorobenzidine	EPA CLP SOW°					20	660		
Benzo(a)anthracene	EPA CLP SOW°					10	330		
Chrysene	EPA CLP SOW°					10	330		
bis(2-ethylhexyl)phthalate	EPA CLP SOW°					10	330		
Di-n-octyl Phthalate	EPA CLP SOW°					10	330		
Benzo(b)fluoranthene	EPA CLP SOW°					10	330		
Benzo(k)fluoranthene	EPA CLP SOW°					10	330		
Benzo(a)pyrene	EPA CLP SOW°					10	330		
Indeno(1,2,3-cd)pyrene	EPA CLP SOW°					10	330		
Dibenz(a,h)anthracene	EPA CLP SOW°					10	330		
Benzo(g,h,i)perylene	EPA CLP SOW°					10	330		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sed	Precision Objective	Accuracy Objective
Target Compound List- Pesticides/PCBs			X	X	X			WATER/SOIL (%RPD)	WATER/SOIL (% Recovery)
alpha-BHC	EPA CLP SOW°					0.05 µg/L	8.0 µg/Kg	••	•••
beta-BHC	EPA CLP SOW°					0.05	8.0		
delta-BHC	EPA CLP SOW°					0.05	8.0		
gamma-BHC (Lindane)	EPA CLP SOW°					0.05	8.0		
Heptachlor	EPA CLP SOW°					0.05	8.0		
Aldrin	EPA CLP SOW°					0.05 µg/L	8.0 µg/Kg		
Heptahlor Epoxide	EPA CLP SOW°					0.05	8.0		
Endosulfan I	EPA CLP SOW°					0.05	8.0		
Dieldran	EPA CLP SOW°					0.10	16.0		
4,4'-DDE	EPA CLP SOW°					0.10	16.0		
Endrin	EPA CLP SOW°					0.10	16.0		
Endosulfan II	EPA CLP SOW°					0.10	16.0		
4,4'-DDD	EPA CLP SOW°					0.10	16.0		
Endosulfan Sulfate	EPA CLP SOW°					0.10	16.0		
4,4'-DDI	EPA CLP SOW°					0.10	16.0		
Methoxychlor	EPA CLP SOW°					0.5	80.0		
Endrin Ketone	EPA CLP SOW°					0.10	16.0		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
Target Compound List-Pesticides/PCBs (Cont.)			X	X	X			WATER/SOIL (%RPD)	WATER/SOIL (% Recovery)
alpha-Chlordane	EPA CLP SOW°					0.5	80.0		
gamma-Chlordane	EPA CLP SOW°					0.5	80.0		
Toxaphene	EPA CLP SOW°					1.0	160.0		
AROCLOR-1016	EPA CLP SOW°					0.5	80.0		
AROCLOR-1221	EPA CLP SOW°					0.5	80.0		
AROCLOR-1232	EPA CLP SOW°					0.5	80.0		
AROCLOR-1242	EPA CLP SOW°					0.5	80.0		
AROCLOR-1248	EPA CLP SOW°					0.5	80.0		
AROCLOR-1254	EPA CLP SOW°					1.0	160.0		
AROCLOR-1260	EPA CLP SOW°					1.0	160.0	(Replicate Analyses)	(Laboratory Control Sample)
RADIONUCLIDES									
gross Alpha	f,g,h,i,k,l,m,n,s	X	X	X	X	2 pCi/L	4 pCi/g	••	•••
gross Beta	f,g,h,i,k,l,m,n,s	X	X	X	X	4 pCi/L	10 pCi/g		
Uranium 233 + 234	f,h,i,m,l,n,s	X	X	X	X	0.6 pCi/L	0.3 pCi/g		
Uranium 235, 238	f,h,i,l,m,n,s	X	X	X	X	0.6 pCi/L	0.3 pCi/g		
Americum 241	i,l,p,q,s	X	X	X	X	0.01 pCi/L	0.02 pCi/g		
Plutonium 239 + 240	i,l,o,p,s	X	X	X	X	0.01 pCi/L	0.03 pCi/g		

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ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Analytic	Method	SW	GW	Borehole	SED	Required Detection Limits - Water	Required Detection Limits - Soil/Sod	Precision Objective	Accuracy Objective
RADIONUCLIDES (Cont.)									
Tritium	f,g,h,i,l,m,s	X	X	X	X	400 pCi/L	400 pCi/g		
Strontium 89,90	f,h,i,l,m,s	X	X	X	X	NA	1 pCi/g		
Strontium 90 only	f,h,i,l,m,s	X	X	X	X	1 pCi/L	NA		
Cesium 137	h,i,l,m	X	X	X	X	1 pCi/L	0.1 pCi/g		
Radium 226	f,g,h,i,l,m,s	X	X			0.5 pCi/L	0.5 pCi/g		
Radium 228	f,g,h,i,l,m,s	X	X			1 pCi/L	0.5 pCi/g		
SURFICIAL SOIL SAMPLE PARAMETERS									
Total Organic Carbon	ALPHA 5310'						1 mg/Kg		
Carbonate	EPA 310.1°						2 mg/Kg		
pH	EPA 150.1°						0.1 pH units		
Specific Conductance	EPA 120.1°						2.5 umho/cm		
Plutonium 239+240	i,l,o,p,s						0.03 pCl/g		
Americum 241	i,l,p,q,s						0.01 pCi/g		
Uranium 233,234,235,238	f,h,i,l,m,n,s						0.06 pCi/g		

ANALYTICAL METHODS, DETECTION LIMITS, AND DATA QUALITY OBJECTIVES

Constituent	Method	SW	GW	Borehole	SED	Readability Objective	Accuracy
FIELD PARAMETERS							
pH	1	X	X			± 0.1 pH unit	± 0.2 pH unit
Specific Conductance	1	X	X			2.5 umho/cm³ 25 umho/cm³ 250 umho/cm³	± 2.5% max error at 500,5000, 50000 umhos/cm plus probe; ± 3.0% max error at 250,1500,25000 plus probe accuracy of ± 2.0%
Temperature	1	X	X			± 0.1°C	± 1.0° C
Dissolved Oxygen	1	X				± 0.1 mg/L	± 10%

* For samples collected from IHSSs 102 and 105 only [BH01,BH02,BH03,BH04,BH05,BH06,BH07,BH08(MW33),BH09,BH15,BH16,BH17,BH18,MW01,MW02,MW03,MW33(BH08)]
** Precision objective = control limits specified in referenced method and/or Data Validation Guidelines.
*** Accuracy objective = control limits specified in referenced method (in GRRASP for radionuclides).
F = Filtered
U = Unfiltered

1. Measured in the field in accordance with instrument manufacturer's instructions. The instruments to be used are specified in Section 12.
2. Medium soil/sediment required detection limits for pesticide/PCB TCL compounds are 15 times the individual low soil/sediment required detection limit.
3. Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment calculated on dry weight basis as required by the contract, will be higher, though the instrument or method detection limit may not equal the required detection limit. This is illustrated in the example below :

For lead :
Method in use - ICP
Instrument Detection Limit (IDL) - 40
Sample Concentration - 220
Required Detection Limit (RDL) - 3

The value of 220 may be reported even though the instrument detection limit is greater than the RDL.

Note : The specified detection limits are based on a pure water matrix. The detection limits for samples may be considerably higher depending on the sample matrix.

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5. If the gross alpha >5 pCi/L, analyze for Radium 226; if Radium 226 > 3 pCi/L, analyze for Radium 228.
6. The detection limits presented were calculated using the formual in W.R.C. Regulatory Guide 4.14, Appendix Lower Limit of Detection, pg.21, and follow:

$$LLD = \frac{4.66\ (BKG/BKG\ DUR)^{\frac{1}{2}}}{(2.22)(Eff)(CR)(SR)(e^{-\lambda t})(Aliq)}$$

Where:

LLD = Lower Limit of Detection in pCi per sample unit.
BKG = Instrument Background in counts per minute (CPM).
Eff = Counting efficiency in cpm/disintegration per minute (dpm)
CR = Fractional radiochemical yield.
SR = Fractional radiochemical yield of a known solution.
λ = The radioactive decay constant for the particular nucleotide.
t = The elapsed time between sample collection and counting
Aliq = Sample Volume
BKG DUR = Background count duration in minutes.

$$MDA = \frac{4.66\ (BKG/Sample\ DUR)^{\frac{1}{2}}}{(2.22)(Eff)(CR)(SR)(e^{-\lambda t})(Aliq)}$$

MDA = Minimum Detectable Activity in pCi per sample unit.
BKG = Same as for LLD.
Eff = Same as for LLD.
CR = Same as for LLD.
SR = Same as for LLD.
λ = Same as for LLD.
t = Same as for LLD.
Aliq = Same as for LLD.
Sample DUR = sample count duration in minutes.

7. On 500 unho/cm range.
8. On 5000 unho/cm range.
9. On 50000 unho/cm range.
a. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version).
b. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version). The specific method to be utilized is at
the laboratory's discretion provided it meets the specified detection limit.
c. U.S. Environmental Protection Agency Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, 7/88 (or latest version).
d. Methods are from "Methods for Chemical Analysis of Water and Wastes," U.S.Environmental Protection Agency, 1983, unless otherwise indicated.
e. Methods are from "Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods," (SW-846, 3rd Ed.) U.S. Environmental Protection Agency.
f. U.S. Environmental Protection Agency, 1979, Radiochemical Analytical Procedures for Analysis of Environmental Samples, Report No. EMSL-LY-0539-1, Las Vegas, NV, U.S. Environmental Protection Agency.
g. American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1985. Standard Methods for the Examination of Water and Wastewater, 16th ed., Washington, D.C.,
Am. Public Health Association.
h. U.S. Environmental Protection Agency, 1976, Interim Radiochemical Methodology for Drinking Water, Report No. EPA-600/4-75-008. Cincinnati U.S. Environmental Protection Agency.
i. Harley, J.H., ed., 1975, ASL Procedures Manual, HASL-300, Washington, D.C., U.S. Energy Research and Development Association.
j. U.S. EPA, 1982. Methods for the Organic Analysis for Municipal and Industrial Waste Water," US EPA-600/4-82-057.
k. "Handbook of Analytical Procedures," USAEC, Grand Junction Lab. 1970, page 196.
l. "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, August 1980, Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio, 45268.
m. "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," U.S.G.S. Book 5, Chapter A5, 1977.
n. "Acid Dissolution Method for the Analysis of Plutonium in Soil," EPA-600/7-79-081, March 1979, U.S. EPA Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 1979.
o. "Procedures for the isolation of Alpha Spectrometrically Pure Plutoniumm Uranium, and Americum," by E.H. Essington and B.J. Drennon, Los Alamos National Laboratory, a private communication.
p. "Isolation of Americium from Urine Samples," Rocky Flats Plant, Health, Safety, and Environmental Laboratories.
q. "Radioactivity in Drinking Water," EPA 570/9-81-002.
r. If the sample or duplicate result is <5 x IDL, then the control limit is ± IDL.
s. U.S. EPA, 1987. "Eastern environmental Radiation Facility Radiochemistry Procedures Manual," EPA-520/5-84-006.

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